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Analysis of New Source Review (NSR) Permitting Experience

TRW, Inc.
Durham, NC

Prepared for

Environmental Protection Agency
Washington, DC

Aug 82

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Pursuant to the Clean Air Act Amendments of 1977 EPA, in 1978, revised its New Source Review (NSR) regulations. The revised Prevention of Significant Deterioration (PSD) regulations were more extensive than their predecessors in that many more sources were subject to PSD requirements. The NSR regulations were again revised in 1980 as a result of litigation. This report deals with a sample of the pre-construction permits issued under EPA´s post-1977 NSR regulations. The data and information contained in this report summarize results of a study directed at assessing the experience of EPA´s New Source Review (NSR) Program. Information extracted from Prevention of Significant Deterioration (PSD) and non-attainment permit files augmented by data obtained from company representatives have been compiled, analyzed and interpreted. An automated (computer) data base has been constructed containing relevant data for each of more than 285 PSD and non-attainment permits issued since 1978.

KEYWORDS: *Licenses, *Air pollution, *Regulations, *New source review, *Air quality.

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ANALYSIS OF NEW SOURCE REVIEW (NSR)
PERMITTING EXPERIENCE

U.S. ENVIRONMENTAL PROTECTION AGENCY
Air Economic Branch
Economic Division
Office of Planning and Resource Management
Washington, D.C.

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Data and analyses presented in this report, in many cases, were extracted from projects performed by TRW under Contract Number 68-02-3515, for which Mr. James Weigold, and Mr. Mike Trutna, Office of Air Quality Planning and Standards, Durham, North Carolina, were the EPA Project Officers. In addition, the analyses for Section 3 of this report, Permit Application Processing Times, were performed by TRW under separate Contract No. 68-01-5838, for which Mr. Scott Flamm, Office of Policy and Resource Management was the EPA Project Officer.

The TRW Project Manager was Mr. L. Hayes. Principal investigators were Messrs. W. Warren-Hicks, L. Bravo, J. Avery, J. Shumaker, P. Gunthorpe, and Ms. D. Wells.

NOTICE

This report is divided into three main sections:

- Executive Summary;
- Full Report; and
- Appendices.

The Executive Summary is a brief summary of the highlights of the report findings and, in addition to being the first section (1.0) of this report, it has also been printed and bound separately.

The body of the report presents all analyses and explanations are provided, as necessary, to allow the reader to better understand the significance of the results. Descriptions of analytical methods used and greater details of the data are contained in the respective appendices: A through G.

The subsections of the Executive Summary correspond to the sections of the full report. For instance, Subsection 1.2 of the Executive Summary and Section 2.0 of the report both deal with descriptions of the data base; Subsection 1.3 of the Executive Summary and Section 3.0 of the report both deal with permit application processing times, and so on.

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1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

Background

Pursuant to the Clean Air Act Amendments of 1977 EPA, in 1978, revised its New Source Review (NSR) regulations. The revised Prevention of Significant Deterioration (PSD) regulations were more extensive than their predecessors in that many more sources were subject to PSD requirements. The NSR regulations were again revised in 1980 as a result of litigation. This report deals with a sample of the pre-construction permits issued under EPA's post-1977 NSR regulations. In the years 1978, 1979 and 1980, EPA issued approximately 1100 NSR permits (about 370 per year, average) consisting mostly of PSD or combination PSD/non-attainment permits.

The data and information contained in this report summarize results of a study directed at assessing the experience of EPA's New Source Review (NSR) Program. Information extracted from Prevention of Significant Deterioration (PSD) and non-attainment permit files augmented by data obtained from company representatives have been compiled, analyzed and interpreted. An automated (computer) data base has been constructed containing relevant data for each of more than 285 PSD and non-attainment permits issued since 1978.

The data base permits were subject to two different PSD Regulations (1978 and 1980) and one "interim" applicability criterion that being the post-Alabama Power "stay" of PSD Regulations in effect between February 5 and August 7, 1980. These regulations are complex and contain different regulatory requirements. An understanding of these regulations is extremely helpful in reading and interpreting this report. For that purpose, a brief description of the PSD and non-attainment regulations and the major differences between the 1978 and 1980 versions is provided in Appendix A of the full report.

Project Objectives

The primary objective of this project was to produce data that characterize recent experience with implementation of EPA's NSR Regulations. The data extracted and compiled was for the purpose of representing a cross-section of PSD and non-attainment permits issued pursuant to the Clean Air Act Amendment of 1977. The results described in this report are not intended as an assessment of the effectiveness (or lack thereof) of the NSR program. The analyses performed and the presentation of results are fashioned to allow the reader to formulate his or her own opinions.

Stringent quality control procedures were used for each step of this project. Accuracy checks were made by attempting to arrive at the same value by two or more independent methods. If results of two methods differed by more than 3%, investigations of the cause(s) were conducted until the difference became less than 3%.

1.2 DATA BASE OF PSD PERMIT APPLICATIONS

Data Base Source Types

The data base consists of 285 PSD applications sampled from the ten EPA regions. Table 1-1 presents a summary of the data base industrial source categories included in the sample by EPA region. The data base applications are grouped into the "named" 28 PSD sources and "other" PSD sources. The "named" 28 sources are subject to a 100 tons/year major source threshold as defined in the PSD regulations. The "other" source categories are subject to a 250 ton per year major source threshold.

Petrochemical and petroleum related sources (108) such as refineries, terminals, compressor stations, etc. constitute 38% of the data base followed by electric utilities (14%).

Data Base Emissions Summary

Table 1-2 presents an emissions summary of PM, SO_2, NO_x, CO and VOC emissions from all data base applications. The emissions presented are the "net emissions changes" and "BACT and LAER permitted emissions". The net emissions changes of a pollutant are calculated as the difference between the gross increases and gross decreases of the pollutant for all data base applications. Most emissions limitations in PSD permits are a result of case-by-case application of either Best Available Control Technology (BACT) for "attainment" pollutants or Lowest Achievable Emission Rate (LAER) for

Table 1-1. DATA BASE PSD APPLICATIONS BY EPA REGION AND SOURCE CATEGORY

	EPA REGION										
Source Category	I	II	III	IV	V	VI	VII	VIII	IX	X	Total
A. Named 28 PSD Sources											
Electric plants with greater than 250 MMBtu/hr heat input	1	1	4	6	5	4	5	5	5	3	39
Coal cleaning plants (with thermal dryers)	0	0	0	0	2	0	0	0	0	0	2
Kraft pulp mills	2	1	1	6	0	1	0	0	0	3	14
Portland cement plants	0	0	0	0	0	2	0	3	0	0	5
Smelters	0	3	2	3	1	0	1	0	0	1	11
Non-metallic mineral process plants	0	0	0	5	2	1	0	0	0	1	9
Carbon black plants	0	0	0	0	0	2	0	0	1	0	3
Chemical plants	1	8	6	9	3	7	1	0	0	1	36
Petroleum refineries	0	1	2	3	0	6	3	1	7	3	26
Other - municipal incinerator, coke oven, fuel conversion, secondary metal, petroleum transfer and glass fiber plants	1	0	2	0	4	1	1	0	0	1	10
Subtotal	5	14	17	32	17	24	11	9	13	13	155
B. Other PSD Sources											
Mining operations	1	3	1	0	1	0	0	2	1	0	9
Asphalt production plants	3	5	4	0	2	0	0	1	1	0	16
Natural gas and crude oil pumping stations	0	0	0	1	4	12	2	11	2	11	43
Natural gas processing plants	0	0	0	0	0	0	0	2	0	1	3
Lumber and wood products manufacturing	4	0	0	1	1	1	0	0	0	1	8
Automotive part manufacturing	0	0	0	1	4	0	2	0	0	0	7
Food processing	0	1	0	4	0	0	0	0	1	0	6
Brewery	0	1	2	0	1	1	0	0	0	0	5
Glass manufacturing	0	0	1	0	1	1	0	0	1	0	4
Municipal incinerators capable of charging less than 250 MMBtu/hr heat input	3	1	0	1	0	0	0	0	0	0	5
Miscellaneous manufacturing/production - computers, electrodes, textiles, fertilizer, salt, kaolin, geothermal power, printing	0	4	1	3	1	0	0	0	2	0	11
Rubber and plastic production plants	0	1	0	2	0	0	0	0	0	0	3
Other - including military bases, laboratories	1	0	4	0	0	0	0	1	2	2	10
Subtotal	12	16	13	13	15	15	4	17	10	15	130
Grand Total	17	30	30	45	32	39	15	26	23	28	285

Table 1-2. EMISSIONS SUMMARY OF PM, SO_2, NO_x, CO and VOC EMISSIONS FROM ALL DATA BASE APPLICATIONS

Pollutant	Net Emissions Changes (tons/year)	BACT and LAER Permitted Emissions
PM	57,000	57,000
SO_2	722,000	777,000
NO_x	709,000	713,000
CO	-107,000[a]	162,000
VOC	-13,000[b]	16,000

[a] This value includes emissions reductions of 299,000 tons/year of CO from two carbon black plants.

[b] This value includes emission reductions of 22,000 tons/year of VOC from one carbon black plant and one kraft pulp mill.

non-attainment pollutants. Those data base emissions that resulted from either BACT or LAER review are presented in the table as "BACT and LAER permitted emissions". In the case of CO, large reductions at two carbon black plants resulting from combustion of process gas are greater than the CO increases in the remainder of the data base. Similarly, VOC emissions indicate a net decrease for the data base. However, many PSD permits supply only estimated VOC emissions and in some cases, VOC emissions were not quantified at all. Therefore, VOC emissions data are not accurate and caution should be used in assessing this data.

PSD Application Submittals

Figure 1-1 shows a chronology of data base PSD applications by submittal date. It appears that "surges" of PSD application submittals occurred at times of actual or anticipated changes in PSD requirements. The first surge occurred just prior to the August 7, 1978 expiration of the monitoring exemption. The second and third surges occurred just prior to the Alabama Power decision and expiration of the "stay" of PSD regulations, respectively.

Overall, the data base consists of 33% new major sources and 67% major modifications. Of the 285 data base applications, 215 were reviewed under the 1978 regulations and 70 were subject to the 1980 (post-Alabama Power) regulations.

1.3 PERMIT APPLICATION PROCESSING TIMES

Summary of PSD Permit Processing Times

Total Processing Time. PSD permit processing times varied widely among data base applications. The time between initial application submittal and permit issuance ranged from 1.4 to 51.3 months.

Table 1-3 summarizes by EPA region the total processing time (from initial application submittal to permit issuance) of all data base applications. By EPA region, processing times averaged 11.0 months and ranged from 8.0 to 14.6 months. As shown on Table 1-3, the average processing time by affiliation of the application reviewer (EPA, State or local agency, or contractor) varied between 10.5 months for EPA personnel to 12.9 months for contractors. Contractors were used by EPA and State agencies to assist in reviewing and processing NSR permit applications. Based on the limited amount of data for contractor and State agency

Figure 1-1.

CHRONOLOGY OF DATA BASE
PSD APPLICATION SUBMITTALS
(By Month Submitted)

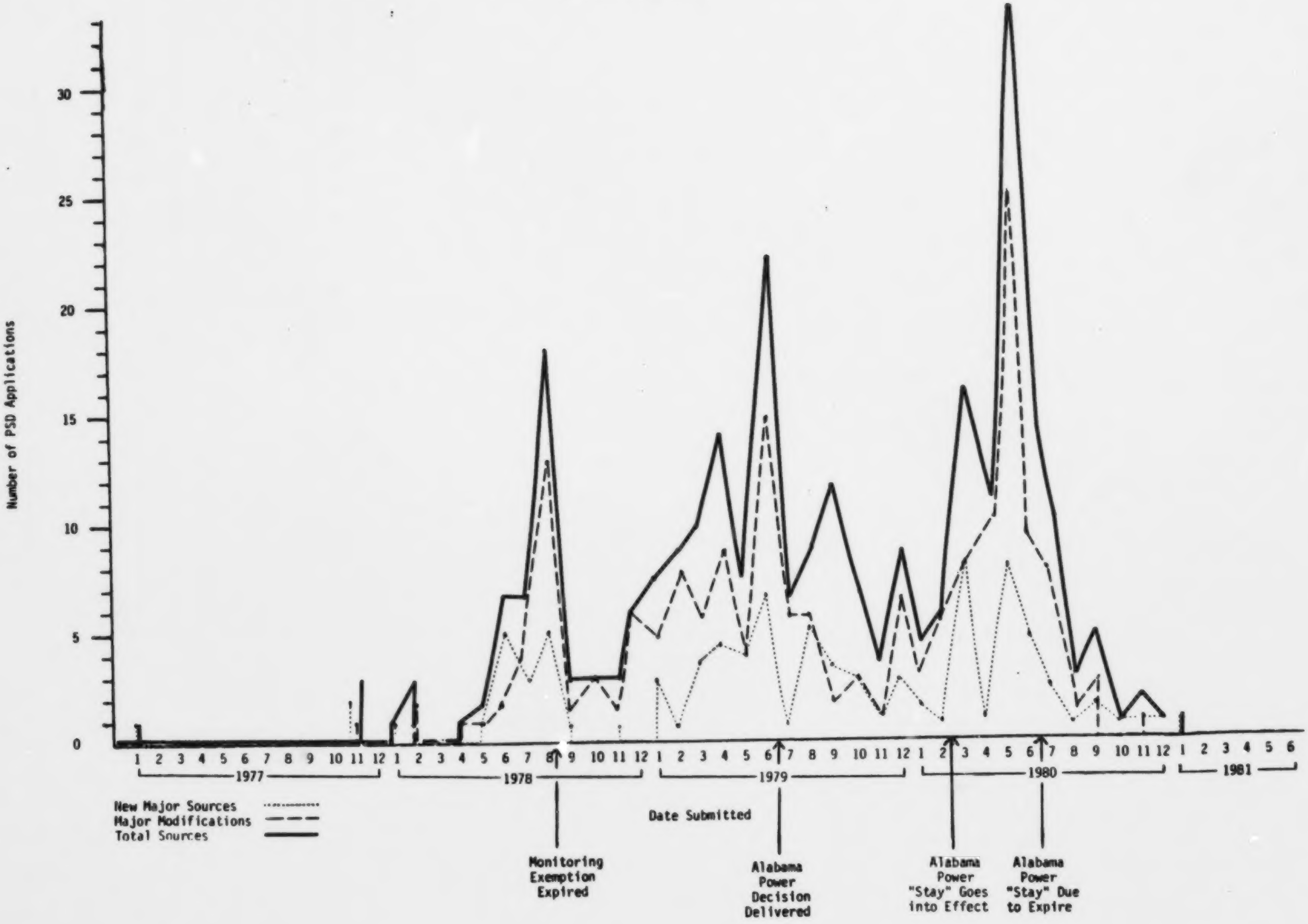


Table 1-3. SUMMARY OF PSD PERMIT PROCESSING TIME (INITIAL APPLICATION SUBMITTAL TO PERMIT ISSUANCE) BY EPA REGION AND APPLICATION REVIEWER

	PSD Application Reviewer								
	EPA Personnel		State Agency Personnel		Contractors				
EPA Region	No. of Applications Reviewed	Average Processing Time (months)	No. of Applications Reviewed	Average Processing Time (months)	No. of Applications Reviewed	Average Processing Time (months)	Total Permits Issued	Overall Average Processing Time (months)	Range of Processing Time (months)
1	17	8.0	0	N/A	0	N/A	17	8.0	2.9 - 15.3
2	30	9.8	0	N/A	0	N/A	30	9.8	1.4 - 20.8
3	29	11.6	0	N/A	1	6.5	30	11.4	3.6 - 37.7
4	1	4.6	33	10.3	11	13.9	45	11.1	2.9 - 32.1
5	32	11.9	0	N/A	0	N/A	32	11.9	4.9 - 24.6
6	0	N/A	0	N/A	39	13.9	39	12.4	5.7 - 37.5
7	15	14.6	0	N/A	0	N/A	15	14.6	2.2 - 31.6
8	24	8.9	0	N/A	2	22.8	26	9.9	3.5 - 27.5
9	21	10.9	1	26.9	1	9.3	23	11.5	2.6 - 51.3
10	28	9.4	0	N/A	0	N/A	28	9.4	3.0 - 19.5
TOTAL	197		34		54		285		
OVERALL AVERAGE PROCESSING TIME (MONTHS)		10.5		10.8		12.9		11.0	
RANGE OF PROCESSING TIME (MONTHS)		1.4 - 51.3		2.9 - 32.1		3.8 - 37.5			1.4 - 51.3

reviewers, it does not appear that processing times were greatly influenced by reviewer affiliation.

As can be determined from Figure 1-2, 25% of the data base permits were processed within 6 months; 68% within one year and 88% within 18 months from the time of initial submittal. It must be recognized that the sampling procedure itself created a potential bias that may cause results of processing time analyses to be misleading when attempting to apply these results to all NSR permits. Permits were selected for inclusion based on reverse chronological order of permit issuance. Therefore, permit applications submitted early and processed quickly and applications submitted late and not processed quickly would not have been selected. This potential bias is further discussed in Section 3.0 of the report.

Application Completeness. Sixty-six (23%) data base applications were deemed officially "complete" upon initial application submittal. The remainder (219) were required to submit additional information for this determination. In a few cases, this required more than two years from the date of initial submittal. Overall, it took an average of 3.7 months from initial submittal to submittal of a "complete" application.

Figure 1-3 shows the distribution of data base applications by the time between initial submittal and determination of "completeness."

As shown below, the fraction of PSD applications that were deemed complete upon initial submittal varied from 0% of the applications in EPA Region I to 52% in Region IX.

EPA Region	Total Number of Data Base Applications in Region	Applications Determined "Complete" Upon Initial Submittal	
		Number	% in Region
I	17	0	0
II	30	11	37
III	30	1	3
IV	45	18	40
V	32	1	3
VI	39	5	13
VII	15	1	7
VIII	26	10	37
IX	23	12	52
X	28	7	26

FIGURE 1-2. DISTRIBUTION OF PERMIT PROCESSING TIMES BY 6 MONTH INTERVALS.

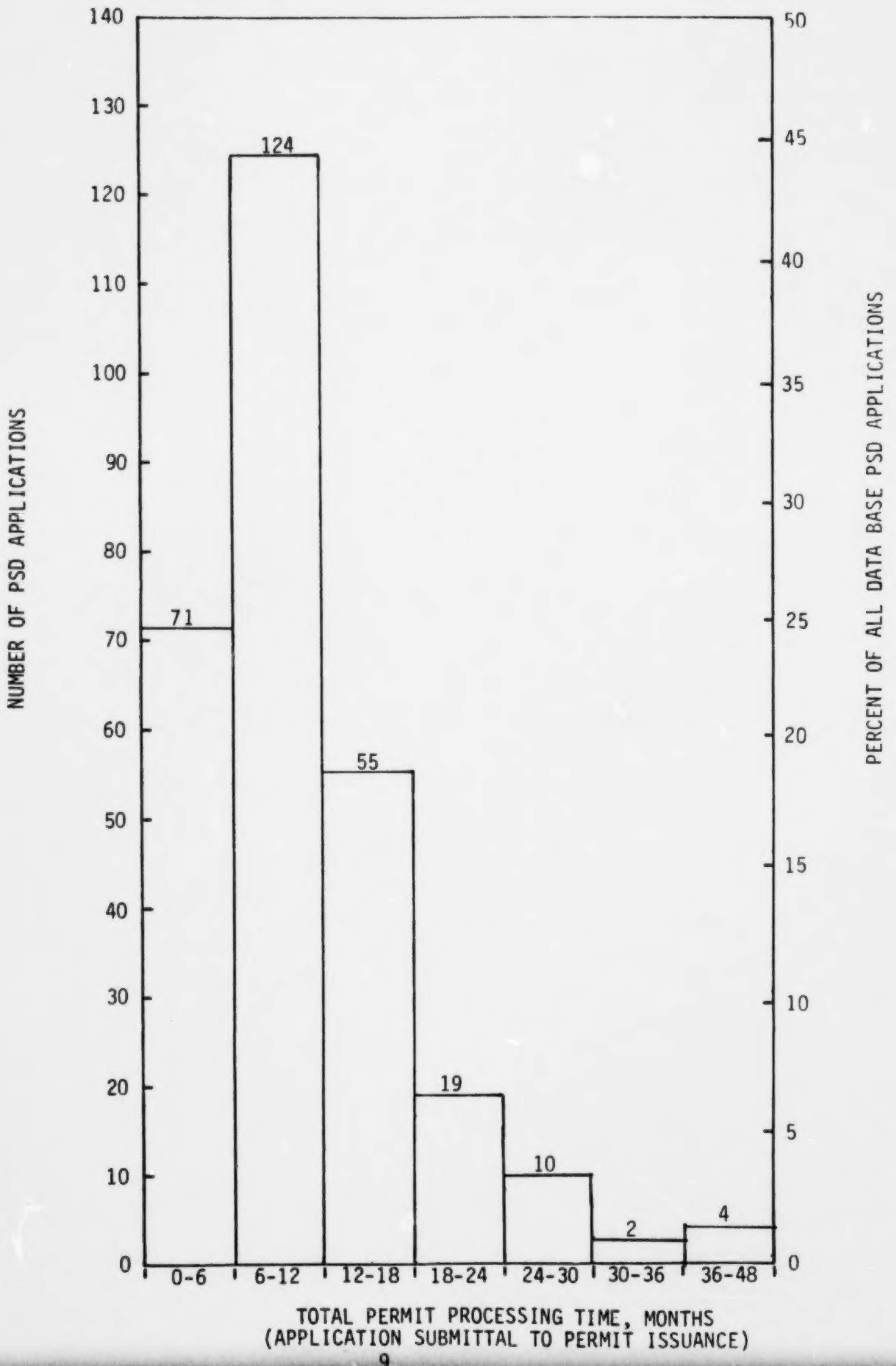
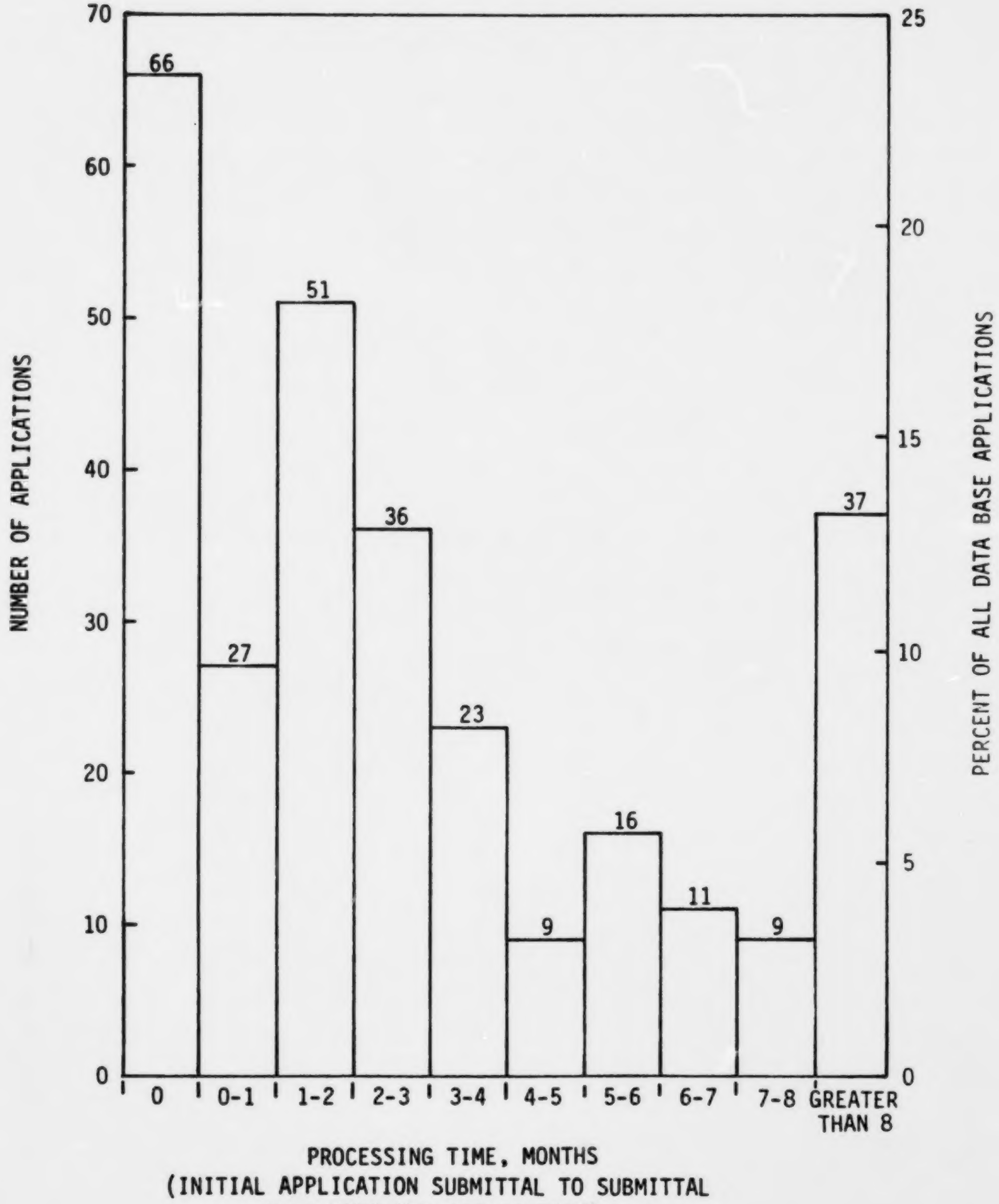


FIGURE 1-3. DISTRIBUTION OF THE PROCESSING TIME BETWEEN INITIAL APPLICATION SUBMITTAL AND SUBMITTAL OF A COMPLETE APPLICATION BY 1 MONTH INTERVALS.



Permit Processing Time From Receipt of Complete Application. The average permit processing time from date of "completeness" to final permit issuance was 7.1 months. By EPA region this average ranged from 5.3 to 9.3 months. As shown in Figure 1-3, almost 90% of the data base applications were processed within one year of submittal of a "complete" application.

Effect of Source Type and Size on Processing Times

From date of initial submittal, utility power plants applications took considerably longer to process than all other source types combined. About 50% of non-utility applications were processed (total time) in less than nine months whereas only 16% of utility applications were processed within that time. Furthermore, almost 60% of utility applications required more than one year to process (total time) whereas only 27% of the non-utility sources required more than one year.

It appears that applications for major modifications required slightly more processing time than those for new major sources. An analysis showed that for major modifications, a direct relationship exists between the length of application processing time and the amounts of pollutants increased (tons/year). This same relationship was not found to be true for new major sources.

Effect of Pre-Application Meetings on Processing Times

For applications submitted in 1978, 1979 and 1980, those that were preceded by meetings between the applicant and the reviewing authority appeared to have experienced shorter total permit processing times than those that did not. Table 1-4 shows that this difference averaged 7.5 months in the last half of 1978 and .8 months in the first half of 1980. The table also shows this difference to gradually disappear in 1980. This may indicate that pre-application contacts were beneficial at the inception of the program, but as people became more aware of the regulations and procedures, pre-application contact diminished in value as far as processing times are concerned. A survey of EPA regional office files shows that about 30% of the data base permits involved pre-application contact between the applicant and the reviewing authority.

Permit Processing Times for Applications Subject to Both PSD and Non-Attainment Review

Twenty-three (23) applications were found to be subject to simultaneous PSD and non-attainment review. For these 24 permits, the time required to obtain both the PSD and non-attainment permits ranged from 3.7 to 37 months and averaged 14.4 months from date of initial submittal to permit issuance.

FIGURE 1-3. DISTRIBUTION OF THE PROCESSING TIME BETWEEN SUBMITTAL OF A COMPLETE APPLICATION AND PERMIT ISSUANCE BY 6 MONTH INTERVALS.

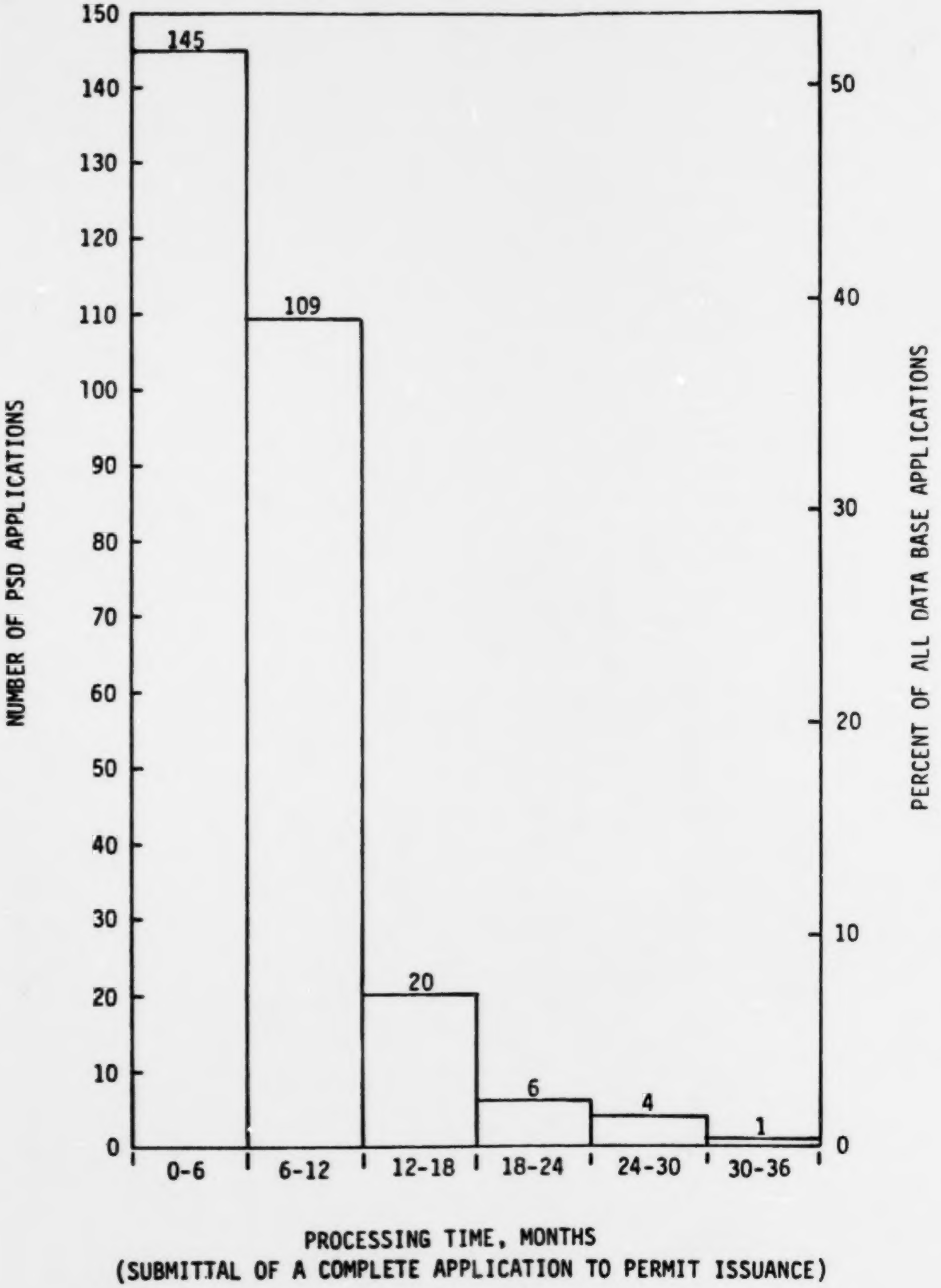


Table 1-4. COMPARISON OF AVERAGE PERMIT PROCESSING TIMES FOR PSD PERMIT APPLICATIONS WITH AND WITHOUT PRE-APPLICATION MEETINGS

	No. of Permits With Pre-submittal Contact	Average Time Span Between Pre-submittal Contact and Final Permit (months)	Average Permitting* Time (months) for Sources With Pre-submittal Contact	No. of Permits Without Pre-submittal Contact	Average Permitting Time* (months) for Sources Without Pre-submittal Contact
1st half 1978	2	14.0	11.0	7	23.9
2nd half 1978	8	16.0	11.0	24	18.5
1st half 1979	14	10.5	7.3	30	7.8
2nd half 1979	17	12.0	7.6	19	9.5
1st half 1980	10	12.2	8.6	43	9.4
2nd half 1980	2	8.0	7.0	18	7.0

*From application submittal to final permit.

1.4 PSD AND NON-ATTAINMENT REVIEW APPLICABILITY

Emissions Subject to Review

Table 1-5 shows the amounts of criteria pollutant emissions reflected in the data base PSD and non-attainment permits. The values, shown in this table, consider only those data base permits that indicate net pollutant emission increases. This table, therefore, more closely depicts the applicability criteria of the 1980 NSR regulations which, unlike the 1978 regulations, generally do not apply to net pollutant decreases. This table also categorizes, by pollutant and size category, the permitted emissions increases for each application. As can be seen, most of the permitted SO_2, NO_x, and CO emissions were caused by applications involving more than 1000 tons/yr increase of these pollutants. This is predominantly the influence of utility power plants and other very large sources. Over 90% of the utility power plants increased emissions of at least one pollutant by more than 1000 tons/yr. Shown below are the relative contributions to total permitted emissions by utility and non-utility (sources other than electric utility generating stations) sources:

Distribution of Data Base Permitted Criteria Pollutant Emissions

	PM	SO_2	NO_x	CO	VOC
Utility Sources	61%	77%	78%	39%	67%
Non-utility Sources	39%	23%	22%	61%	33%

Permit Applications Eliminated From Review at Various Thresholds

Figure 1-4 shows the relationship between the number of data base permit applications that would be eliminated from review and alternative applicability thresholds. These thresholds assume uniform "new major source" (tons/year potential emissions) and "deminimis" values (tons/yr increase in "actual" emissions) for major modifications. Table 1-6 shows the percentage of applications eliminated from review at uniform applicability thresholds of 100, 500 and 1000 TPY. Also shown on this table are the percentages of pollutant reviews and emissions eliminated from review at each threshold. These latter items should not be construed

Table 1-5. DISTRIBUTION OF PERMITTED EMISSION INCREASES OF PM, SO_2, NO_x, CO AND VOC AT VARIOUS APPLICATION SIZE CATEGORIES

Emissions Size Category (Permitted Emissions Increase, Tons/Yr Per PSD Application)[a]	Pollutant (tons/year)									
	PM		SO_2		NO_x		CO		VOC	
	t/yr (1000's)	% of total	t/yr (1000's)	% of total	t/yr (1000's)	% of total	t/yr (1000's)	% of total	t/yr (1000's)	% of total
0 - significant level[b]	.7	1	.6	<1	.3	<1	2.1	1	1.2	5
Significant level - 100	3.3	5	.8	<1	.8	<1	NA[c]		1.3	6
100 - 500	11.0	18	10.3	1	15.9	2	14.0	6	7.0	31
500 - 1000	12.0	19	13.0	2	27.0	4	14.0	6	4.0	18
Greater than 1000	35.0	57	708.0	97	665.0	94	218.0	87	9.0	40
TOTAL	62.0	100	732.7	100	709.0	100	248.1	100	22.5	100

[a] Emissions from applications with permitted net decreases are not included in the table; emissions are discrete values within each category.

[b] Significant levels as defined in the 1980 PSD regulations (tons/year): PM = 25; SO_2 = 40; NO_x = 40; CO = 100; VOC = 40.

[c] 100 tons/year emission increase is the significance level for CO emissions.

Figure 1-4. DATA BASE APPLICATIONS ELIMINATED FROM PSD REVIEW AT VARIOUS APPLICABILITY THRESHOLDS

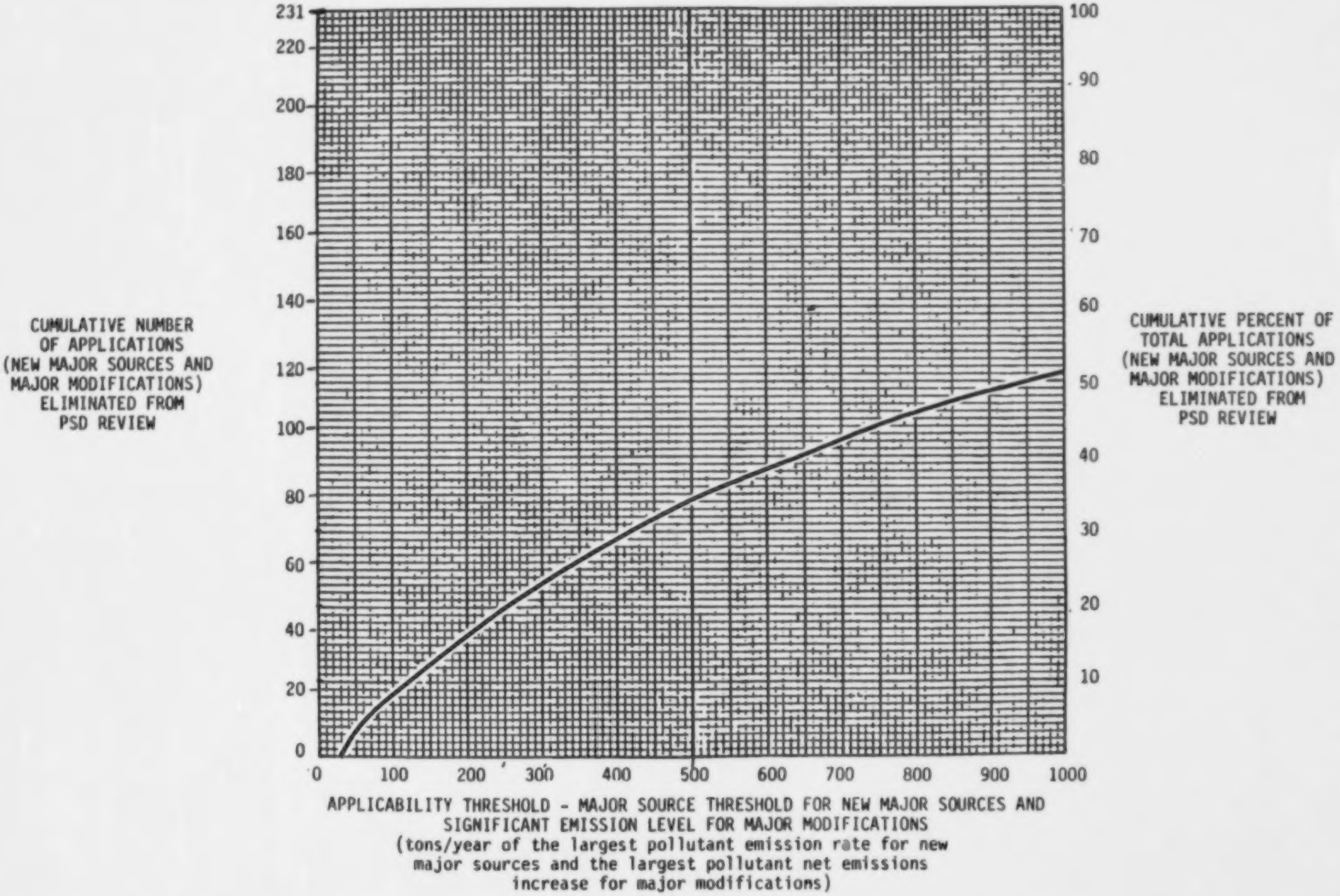


Table 1-6. THE NUMBER OF CRITERIA POLLUTANT REVIEWS AND AMOUNT OF ASSOCIATED EMISSIONS ELIMINATED AT SELECTED UNIFORM APPLICABILITY THRESHOLDS

Emissions Threshold (TPY)	Pollutant	% of Pollutant Reviews Eliminated	% of Emissions Eliminated	% of PSD Applications Eliminated
100	PM	45	6	7
	SO_2	8	<1	
	NO_x	7	<1	
	CO	NA	NA	
	VOC	43	8	
500	PM	80	25	33
	SO_2	34	2	
	NO_x	40	2	
	CO	55	6	
	VOC	84	40	
1000	PM	91	44	51
	SO_2	47	3	
	NO_x	61	6	
	CO	72	11	
	VOC	94	60	

to represent elimination of the complete NSR application from review. This simply is the elimination from review of one or more pollutants per application out of several pollutants that may be subject to review. For instance, at a uniform "deminimis" threshold of 100 tons per year, 7% of the applications that would otherwise be subject to PSD review would be exempt. At this level, 45% of the particulate matter (PM) reviews would be eliminated. This means that the PM emission increases subject to PSD review in 45% of the data base applications were less than 100 tons per year. The PM emissions increase associated with these applications is only 6% of the total data base PM emissions.

In contrast, at a uniform 100 TPY deminimus threshold, only 8% and 7% of the SO_2 and NO_x reviews, respectively, would be exempt. The SO_2 and NO_x emissions increases associated with these reviews are each less than 1% of the total SO_2 and NO_x emissions in the data base.

1.5 ANALYSIS OF BACT AND LAER ASSOCIATED WITH FINAL PERMIT EMISSIONS LIMITATIONS

The emissions values presented in this section reflect only those that were subject to and permitted according to BACT (Best Available Control Technology) and where applicable, LAER (Lowest Achievable Emission Rate). They do not include emissions reductions resulting from equipment shutdowns and similar situations nor do they include permit limitations that were specified solely for the purpose of issuing federally enforceable permit conditions for exemption purposes.

Technology Reviews

Table 1-7 shows, by pollutant, the number of data base applications and emissions units that were subject to BACT or LAER.

As can be seen, NO_x emissions were found to be the pollutant most frequently subject to BACT; VOC emissions were most frequently subject to LAER. Only five of the nine non-criteria pollutants were subject to BACT.

Effects of NSPS and NESHAPS on BACT and LAER

Emission Units. Table 1-8 shows the number of data base emission units that were subject to an NSPS (or NESHAP) and received emissions limitations:

- At the maximum emission rate allowed by the NSPS; and
- At an emissions rate more stringent than the maximum allowed by the NSPS.

Table 1-7. DATA BASE BACT AND LAER APPLICABILITY BY SOURCE AND EMISSION UNITS

Pollutant	Number of Applications (Sources) Subject to BACT*	Number of Applications (Sources) Subject to LAER*	Number of Emission Units Subject to BACT	Number of Emission Units Subject to LAER
Particulate Matter (PM)	163	15	589	35
Sulfur Dioxide (SO_2)	157	6	429	9
Nitrogen Oxides (NO_x)	186	3	727	6
Carbon Monoxide (CO)	95	6	427	12
Volatile Organic Compounds (VOC)	43	26	144	40
Fluorides (F)	9	-	18	-
Vinyl Chlorides	1	-	4	-
Total Reduced Sulfur (TRS)	3	-	6	-
Hydrogen Sulfide (H_2S)	2	-	2	-
Sulfuric Acid Mist	3	-	4	-
Total Technology Reviews			2350	102

*Most applications (sources) were subject to either BACT and/or LAER for more than one pollutant. Therefore, the sum of these columns is greater than the number of data base sources.

Table 1-8. TECHNOLOGY REVIEWS SUBJECT TO NSPS (OR NESHAP) PERMITTED FOR BACT AT NSPS (OR NESHAP) RATE AND BELOW NSPS (OR NESHAP) RATE*

NSPS (or NESHAP) Pollutant

	Particulate Matter (PM)		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Carbon Monoxide (CO)		Hydrogen Sulfide (H_2S)	Fluorides (F)	Reduced Sulfur (TRS)	Vinyl Chloride	H_2SO_4 Mist
	Total	Utilities only	Total	Utilities only	Total	Utilities only	Total	Utilities only	Total	Total	Total	Total	Total
Number of emission units permitted for BACT at NSPS (or NESHAP) rate	75	31	107	35	135	45	7	0	1	14	3	4	2
Number of emission units permitted for BACT below NSPS (or NESHAP) rate	34	15	51	26	24	20	2	0	0	4	1	0	1
% NSPS (or NESHAP) units subject to BACT permitted below NSPS (or NESHAP) rate	31%	32%	32%	43%	15%	30%	22%	–	0%	22%	25%	0%	33%
Ratio of BACT to NSPS Allowable Emission Rate for Emission Units Permitted Below NSPS Rate	.49	.50	.45	.44	.79	.79	.52	–	–	.44	.84	–	.67

*An emission unit subject to NSPS for 2 pollutants is considered to undergo 2 technology reviews.

Note: Most VOC NSPS (or NESHAP) are work practice or equipment standards - unable to quantify emissions.

Similar statistics specific to utility sources are also shown. For all data base emission units subject to NSPS (or NESHAPS), 27% were issued emission limits more stringent than the applicable NSPS (or NESHAP) would allow. This value is 36% for utility power plant sources. On a criteria pollutant specific basis for all data base sources, this value ranged from 15% for NO_x emissions to 32% for SO_2. For utilities, this value ranged from 30% for NO_x emissions to 43% for SO_2 emissions.

The bottom line on Table 1-8 shows, for emission units permitted more stringent than the applicable NSPS, the ratio of the average BACT-permitted emissions rates to the average of the maximum emissions rates allowed by the applicable NSPS (or NESHAP).

Allowable Emissions. Table 1-9 shows a distribution of all BACT-permitted emissions by utility and non-utility sources including those BACT-permitted emissions subject to NSPS (or NESHAP). Also shown are emissions reductions beyond NSPS (or NESHAP) resulting from emissions limitations being more stringent than the applicable NSPS. As can be seen, the majority of emissions reductions beyond NSPS occurred at utility sources. Note, however, that the majority of BACT-permitted emissions subject to NSPS also occurred at utility sources. This relationship is shown below for PM, SO_2, NO_x and CO emissions:

	Relative Contribution to Emission Reductions Beyond NSPS		Relative Contribution to BACT-Permitted Emissions Subject to NSPS	
Pollutant	Utility Sources	Non-utility Sources	Utility Sources	Non-utility Sources
PM	79%	21%	79%	21%
SO_2	96%	4%	93%	7%
NO_x	98%	2%	90%	10%
CO	0%	100%	0%	100%

It appears that the distribution of emission reductions beyond NSPS is fairly consistent with the distribution of BACT-permitted emissions subject to NSPS for utility and non-utility sources.

Table 1-9. TOTAL BACT-PERMITTED POLLUTANT EMISSIONS, EMISSIONS SUBJECT TO NSPS (OR NESHAPS) AND EMISSIONS REDUCTIONS BEYOND NSPS (OR NESHAPS) BY UTILITY POWER PLANT SOURCES AND NON-UTILITY SOURCES

	PSD Pollutant																			
	Particulate Matter (PM)		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Carbon Monoxide (CO)		Volatile Organic Compounds (VOC)*	Hydrogen Sulfide (H_2S)		Fluorides (F)		Total Reduced Sulfur (TRS)		Vinyl Chloride		H_2SO_4 Mist	
	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NESHAPS	Total	Subject to NSPS
BACT permitted emissions for non-utility sources - tons/yr	22,800	7,400	192,400	41,500	162,500	63,700	97,600	7,500	9,200	700	580	300	300	1,160	60	110	110	180	120
BACT permitted emissions for utility sources - tons/yr	31,400	27,800	569,400	561,900	549,900	542,600	61,500	0	4,500	0	0	510	0	0	0	0	0	0	0
Total BACT permitted emissions - tons/yr	54,200	35,200	761,800	603,400	712,400	606,300	159,100	7,500	13,700	700	580	810	300	1,160	60	110	110	180	120
BACT permitted emissions reductions beyond NSPS by non-utility sources - tons/yr	-	1,600	-	8,500	-	1,200	-	2,970	-	-	0	-	240	-	1	-	0	-	2
BACT permitted emissions reductions beyond NSPS by utility sources - tons/yr	-	6,100	-	210,200	-	53,200	-	0	-	-	0	-	0	-	0	-	0	-	0
Total BACT permitted emission reductions beyond NSPS - tons/yr	-	7,700	-	218,700	-	54,400	-	2,970	-	-	-	240	-	1	-	0	-	2	

*VOC NSPS's are generally work practice or equipment standards. Unable to quantify VOC emissions subject to NSPS.

For all pollutants, on a percentage basis, more utility emissions are subject to NSPS than non-utility emissions:

	BACT-Permitted Emissions (TPY)				
		Subject to NSPS			
	Total Data Base	Total	% of Data Base	Emission Reductions Beyond NSPS (TPY)	Total "Hypothetical" NSPS Allowable Emissions (TPY)
Utility Sources	1,220,000	1,130,000	93%	270,000	1,400,000
Non-utility Sources	487,000	121,000	25%	14,500	135,500
Total	1,707,000	1,251,000	73%	284,500	1,535,500

For all sources, 73% of the BACT-permitted emissions were subject to NSPS. Twenty-five percent (25%) of non-utility source emissions are subject to NSPS (or NESHAP), whereas 93% of utility source emissions are subject to NSPS.

BACT vs. LAER

Of the 285 PSD applications, 35 were subject to non-attainment review for certain pollutants. The data were extracted from EPA files which, in most cases, do not contain LAER technology data since LAER reviews are performed by State agencies. Therefore, sufficient LAER control technology data are available for only 15 of the 35 PSD applications to compare with BACT data. The 15 applications include 26 emissions units subject to LAER technology review for one or more pollutants. The total number of LAER technology reviews in these applications, determined by counting the number of non-attainment pollutants reviews for each emission unit, is 54.

Table 1-10 lists ranges of typical ranges of BACT emissions limits for comparison with the 54 LAER review emission limits. The upper and lower ends of these ranges do not represent the extremes for all BACT determinations made. Rather, they represent "typical" determinations based on BACT limits from the data base (285) PSD permits and EPA's Compilation of BACT/LAER Determinations.

Comparisons of LAER allowable emission rates with BACT ranges show that LAER emissions are generally in the lower portions of the BACT ranges. However, it does not appear that LAER produces a distinguishable level of stringency over BACT.

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a]

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
1. PPG Industry 79 WV 06	4	Boiler - 243 MMBtu/hr 1.7% S, 14.3% ash bituminous coal	PM	Baghouse	0.042 lb/MMBtu	None	Yes	0.016 to >0.1 lb/MMBtu[c]
2. General Motors Corp. EPA-5-A-80-12	5	Boiler - 150 MMBtu/hr 0.7% S fuel oil	SO_2	Low Sulfur Fuel	1.0 lb/MMBtu	None	Yes	0.5 to 1.2 lb/MMBtu[d]
3. General Motors Corp. EPA-5-A-80-6	5	2 - boilers, 156 MMBtu/hr each, 0.87% S, 10% ash coal	PM	Baghouse	0.06 lb/MMBtu	None	Yes	0.016 to >0.1 lb/MMBtu[c]
		Coal storage pile fugitives	PM	Surfactant Spray Suppression	None	None	Yes	N/A
4. Muscatine Power and Water	7	Electric steam generator - 1546 MMBtu/hr (166MW), 3.1% S, 8.7% ash coal	PM	Baghouse	0.03 lb/MMBtu (203 TPY)	0.03 lb/MMBtu (203 TPY)	Yes	.015 to .03 lb/MMBtu[e]
5. Tennessee Eastman TN-065	4	2 - boilers, 780 MMBtu/hr each, low sulfur coal	PM	ESP	0.018 lb/MMBtu (123 TPY)	0.1 lb/MMBtu (683 TPY)	Yes	0.016 to 0.1 lb/MMBtu[e]
		Coal pile fugitives	PM	Chemical Surfactants	None	None	Yes	N/A

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
6. Gilman Paper GA-071	4	Coal/wood/oil boiler - 587 MMBtu/hr on coal (1.5% S; 12% ash) and 941 MMBtu/hr on wood (<0.1% S); fuel oil sulfur content is about three percent	PM	ESP	0.07 lb/MMBtu (227 TPY)	0.1 lb/MMBtu (324 TPY)	Yes	.016 to 0.1 lb/MMBtu[e]
			SO_2	Caustic Scrubber	Wood/Coal - 1.2 lb/MMBtu (2143 TPY) Wood/Oil - 0.8 lb/MMBtu	1.2 lb/MMBtu (2143 TPY) 0.8 lb/MMBtu	Yes	.33 to 1.2[e] lb/MMBtu
7. Firestone Tire Co. GA-068	4	Tire sealant lines (2), capacity is confidential.	VOC	Carbon Adsorption Minimum 90% Efficiency	7.4 lb/hr	None	No	Unable to find BACT comparison. Incineration is typical VOC BACT.
		Fugitives from warehouse ventilation	VOC	No Control	58 lb/hr	None	Yes	N/A
8. Firestone Tire Co. GA-067	4	Boiler - 96.4 MMBtu/hr; 1% S oil or gas fired	CO	Combustion Controls	0.08 lb/MMBtu	None	Yes	0.03 to 0.41 lb/MMBtu[d]
9. Ashland Petroleum KY-155	4	Reduced crude conversion system 55,000 BBL/day	PM	Venturi Scrubber	0.45 lb/1000 lb coke burnoff (299 TPY)	1.0 lb/1000 lb coke burnoff (644 TPY)	Yes	0.5 to 1.0 lb/ 1000 lb coke burnoff
			SO_2	Venturi Scrubber	437 lb/MBBL Feed	None	No	500 to 1100 lb/MBBL Feed
			VOC	Waste CO Boiler Incineration	8 PPMV	None	Yes	Unable to find BACT comparison. CO boiler is typical.

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
		Fugitive VOC from equipment leaks	VOC	Leak Detection and Repair	None	None	Yes	N/A
10. Nevada Power Company NV-80-01	9	No. 8 gas turbine generator - 73.5 Megawatts output, ≈800 MMBtu/hr heat input; 0.25% S, low ash fuel oil fired	PM	Low Ash Fuel	≈0.03 lb/MMBtu	None	Yes	0.04 to 0.11 lb/MMBtu
			CO	No Control	≈0.13 lb/MMBtu	None	Yes	0.12 to 0.68 lb/MMBtu
			VOC	No Control	≈0.006 lb/MMBtu	None	Yes	0.02 to 0.11 lb/MMBtu
11. Nevada Power Company NV-78-02	9	No. 7 gas turbine generator - 73.5 Megawatts output ≈800 MMBtu/hr heat input; 0.25% S, low ash fuel oil or natural gas fired	PM	Low Ash Fuel	≈0.03 lb/MMBtu	None	Yes	0.04 to 0.11 lb/MMBtu
			CO	No Control	≈0.13 lb/MMBtu	None	Yes	0.12 to 0.68 lb/MMBtu
			VOC	No Control	≈0.006 lb/MMBtu	None	Yes	0.02 to 0.11 lb/MMBtu
12. Borg Warner EPA-5-A-80-4	5	Resin compounding facility - 15 process vents	VOC	Waste Air Burner	9.2 lb/hr	None	Yes	Similar to solvent (VOC) emissions BACT. Unable to quantify comparable BACT limits.

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
13. City of Columbus EPA-5-A-80-3	5	6 - refuse and coal fired electric steam generators; 246 MMBtu/hr ea; coal is 0.9% S, and 10% ash	PM	ESP	0.1 lb/MMBtu	None	Yes	0.033 to >0.1 lb/MMBtu
			SO_2	Low Sulfur Fuel	0.95 lb/MMBtu	None	Yes	0.63 to >1.2 lb/MMBtu
			CO	Combustion Controls	0.26 lb/MMBtu	None	Yes	0.25 to 5.1 lb/MMBtu
			VOC	Combustion Controls	0.016 lb/MMBtu	None	Yes	0.043 to 0.25 lb/MMBtu
14. Weyerhauser Longview PSD-X-81-02	10	Boiler - 1240 MMBtu/hr; coal 0.8% S; 18.7% ash	PM	Electro-Scrubber	0.03 lb/MMBtu (163 TPY)	0.1 lb/MMBtu (543 TPY)	No	0.016 to 0.1 lb/MMBtu
15. Publishers Paper PSD-X-80-03	8	Boiler - 552.5 MMBtu/hr; hog fuel (wood and bark)	VOC	Combustion Controls	0.26 lb/MMBtu	None	Yes	0.25 to 4.4 lb/MMBtu
16. Modesto Irregation District NSR-4-4-8 SJ 79-16	9	Gas turbine 1693 MMBtu/hr; 0.3% S fuel oil	NO_x	Unknown	75 ppmv	75 ppmv	Unknown	75-150 ppmv

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (concluded)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
17. Refuse Fuels Incorporated	1	Refuse incinerator; 960 tons/day	PM	Unknown	0.03 gr/dscf (96 TPY)	0.08 gr/dscf (257 TPY)	Unknown	0.02 to 0.08 gr/dscf
			VOC	Unknown	7.99 lb/hr	None	Unknown	Unknown

[a] The data base contains 285 applications of which 35 required concurrent PSD and non-attainment review. LAER technology data is available for only 15 of the 35 applications (table entries 1-15). Seven applications have units subject to both NSPS and LAER (table entries 4-6, 9, 14, 16 and 17).

[b] Range of typical BACT limits as determined from the Compilation of BACT/LAER Determinations, revised (450/2-80-070, May 1980), data base BACT determinations and AP-42 emission factors. This range does not encompass all BACT determinations, but indicates the typical values specified for BACT in PSD permits.

[c] The range is for coal fired industrial boilers with less than or equal to 250 MMBtu/hr heat input (not subject to NSPS).

[d] The range is for oil fired industrial boilers with less than 250 MMBtu/hr heat input (not subject to NSPS).

[e] Range is for coal fired boilers with greater than 250 MMBtu/hr heat input (least stringent BACT or LAER is the applicable NSPS).

Effect of Emission Unit Size on BACT-Permitted Emissions and Emissions Reductions Beyond NSPS

Shown in Tables 1-11 through 1-15 are distributions of BACT-permitted emissions, BACT-permitted emissions subject to NSPS, and emission reductions beyond NSPS by sizes of emission units. The size of an emission unit is based on its annual BACT-permitted emission rate in tons per year. The data are presented both graphically and in tabular format.

As shown on Table 1-11, 59% of all BACT-permitted PM emissions units are less than 25 tons/year in size and represent only 5% of the BACT permitted PM emissions in the data base. In this size range, only 8% of the PM emissions units were subject to NSPS.

Only five PM emission units (1% of total) were permitted to emit greater than 1000 tons/year PM. All five of these were subject to NSPS and were permitted at the maximum emission rate allowed by the NSPS (therefore, no emissions reductions beyond NSPS were realized for this size class). The size class of 100-500 tons/year and 500-1000 tons/year produced the majority (80%) of emission reductions beyond NSPS. The NSPS emission units in these size categories were permitted to emit 24,400 tons/year PM (17% + 18% = 45% of 54,200 tons/year), some 6100 tons/year PM less than the level allowed by the NSPS.

In contrast to PM, SO_2 emission units greater than 1000 tons/year size were permitted to emit the majority of SO_2 emissions. As shown in Table 1-12, 26% of all SO_2 emission units and 92% of all BACT-permitted SO_2 emissions are in this size class. Furthermore, the majority of SO_2 emission reductions beyond NSPS were achieved in this size class. This size class generally consists of utility and large industrial boilers. Some industrial boilers in this category were not subject to NSPS because of their heat input (less than 250 MMBtu/hr). Note that the 0-40 tons/year SO_2 size class emission units are 34% of all SO_2 emission units. However, the corresponding allowable SO_2 emissions for these units are less than 1% of the total SO_2 emissions in the data base. Interestingly, 47% of the emission units in the 0-40 ton category were subject to NSPS. These small NSPS emissions units consist mainly of heaters, boilers and furnaces at petroleum refineries burning refinery fuel gas and are generally subject to NSPS.

Table 1-11. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: PARTICULATE MATTER (PM)

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted PM Emission Units*		BACT-Permitted PM Emissions**		BACT-Permitted PM Emission Units Subject to NSPS		BACT-Permitted PM Emissions Subject to NSPS		PM Emission Reductions Beyond NSPS Subject to BACT***	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all PM emission reductions beyond NSPS	Cum. % of all PM emission reductions beyond NSPS
0 - 25	348	59	59	5	5	8	5	10	1	14	14
25 - 100	129	22	81	12	17	17	4	18	2	6	20
100 - 500	80	14	95	33	50	39	5	52	17	38	58
500 - 1000	27	4	99	33	83	85	4	86	28	42	100
>1000	5	1	100	17	100	100	1	100	17	0	100

* Total BACT-permitted PM emission units = 589.
** Total BACT-permitted PM emissions = 54,200 tons/year.
***Total BACT-permitted PM emission reductions beyond NSPS = 7,700 tons/year.

Table 1-12. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: SULFUR DIOXIDE (SO_2)

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted SO_2 Emission Units*		BACT-Permitted SO_2 Emissions**		BACT-Permitted SO_2 Emission Units Subject to NSPS		BACT-Permitted SO_2 Emissions Subject to NSPS		SO_2 Emission Reductions Beyond NSPS Subject to BACT***	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all SO_2 emission reductions beyond NSPS	Cum. % of all SO_2 emission reductions beyond NSPS
0 - 40	144	34	34	<1	<1	47	16	35	<1	1	1
40 - 100	30	7	41	<1	<1	17	1	14	<1	<1	1
100 - 500	93	22	63	3	3	9	2	8	<1	<1	1
500 - 1000	49	11	74	5	8	20	2	23	1	13	14
>1000	113	26	100	92	100	59	16	85	78	86	100

* Total BACT-permitted SO_2 emission units = 429.
** Total BACT-permitted SO_2 emissions = 761,800 tons/year.
***Total BACT-permitted SO_2 emission reductions beyond NSPS = 218,700.

Table 1-13. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: NITROGEN OXIDES (NO_x)

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted NO_x Emission Units*		BACT-Permitted NO_x Emissions**		BACT-Permitted NO_x Emission Units Subject to NSPS		BACT-Permitted NO_x Emissions Subject to NSPS		NO_x Emission Reductions Beyond NSPS Subject to BACT***	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all NO_x emission reductions beyond NSPS	Cum. % of all NO_x emission reductions beyond NSPS
0 - 40	189	26	26	<1	<1	3	<1	5	<1	0	0
40 - 100	122	17	43	1	1	7	1	8	<1	0	0
100 - 500	257	35	78	9	10	13	5	16	1	2	2
500 - 1000	79	11	89	8	18	56	6	59	5	0	2
>1000	80	11	100	82	100	86	9	97	79	98	100

* Total BACT-permitted NO_x emission units = 727.

** Total BACT-permitted NO_x emissions = 712,400 tons/year.

***Total BACT-permitted NO_x emission reductions beyond NSPS = 54,400 tons/year.

Table 1-14. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: CARBON MONOXIDE (CO)

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted CO Emission Units*		BACT-Permitted CO Emissions**		BACT-Permitted CO Emission Units Subject to NSPS		BACT-Permitted CO Emissions Subject to NSPS		CO Emission Reductions Beyond NSPS Subject to BACT***	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all CO emission reductions beyond NSPS	Cum. % of all CO emission reductions beyond NSPS
0 - 100	297	69	69	4	4	0	0	0	0	0	0
100 - 500	71	17	86	10	14	1	<1	2	<1	0	0
500 - 1000	20	5	91	10	24	20	1	20	2	45	45
>1000	39	9	100	76	100	5	<1	3	3	55	100

* Total BACT-permitted CO emission units = 427.
** Total BACT-permitted CO emissions = 159,100 tons/year.
***Total BACT-permitted CO emission reductions beyond NSPS = 2,970 tons/year.

Table 1-15. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: VOLATILE ORGANIC COMPOUNDS (VOC)

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted VOC Emission Units*		BACT-Permitted VOC Emissions**	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total
0 - 40	88	61	61	6	6
40 - 100	16	11	72	6	12
100 - 500	35	24	96	58	70
500 - 1000	4	3	99	18	88
>1000	1	1	100	12	100

* Total-BACT permitted VOC emission units = 144.

** Total-BACT permitted VOC emissions = 13,700 tons/year.

Note: VOC NSPS's are generally work practice or equipment standards. Unable to quantify VOC emissions subject to a NSPS.

Table 1-13 for NO_x emissions is similar to Table 1-12 for SO_2 emissions in that the majority of permitted emissions and emissions reductions beyond NSPS occurred at emissions units greater than 1000 tons/year size.

Total BACT-permitted allowable PM, SO_2, NO_x and CO emissions and emissions reductions beyond NSPS are as follows:

Pollutant	Total BACT-Permitted (tons/year)	Reductions Beyond NSPS (tons/year)
PM	54,200	7,700
SO_2	761,800	218,700
NO_x	712,400	54,400
CO	159,100	2,970

Corresponding values for VOC emissions reductions beyond NSPS are not presented since most VOC standards are based on the type of equipment used and/or work practices, and quantification in terms of emissions is difficult.

Emission Reductions From Proposed BACT Emission Levels

In at least 63 data base applications (22%), PSD applicants received emissions limitations more stringent than those proposed as BACT. Factors such as air quality impacts, increment consumption and case-by-case evaluation influenced the permitting authorities' decision process. In some cases, these sources were subject to NSPS and the associated emissions reductions in those cases were accounted for in the previous subsection.

Table 1-16 shows the (non-NSPS) data base emissions reductions caused by PSD permits issued with emission limits more stringent than those proposed by the applicant in addition to emissions reductions beyond NSPS.

Effect of PSD on Allowable Emissions

It is impossible to determine the levels at which the data base sources would have been allowed to emit in the absence of PSD provisions. For example, for sources not subject to NSPS, an applicant might have proposed and been allowed to emit pollutants at the levels prescribed in the respective State Implementation Plan (SIP). In other cases, however, an emissions limiting factor may have been the NAAQS ceilings, or other air quality factors. Quantification of these "upper bounds" for non-NSPS sources was beyond the scope of this project.

Table 1-16. CUMULATIVE BACT PERMITTED EMISSIONS REDUCTIONS ASSOCIATED WITH PSD

	Pollutant									
	PM	SO_2	NO_x	CO	VOC	H_2S	F	TRS	Acid Mist	Vinyl Chloride
Emissions reductions beyond NSPS - tons/yr	7,700	218,700	54,400	2,970	N/A	0	240	2	2	
Non-NSPS emissions reductions associated with proposed vs. permitted BACT - tons/yr	5,100	34,200	5,100	3,000	N/A	0	0	0	0	
Total emissions reductions - tons/yr	12,800	252,900	59,500	5,970	N/A	0	240	2	2	
Total BACT-permitted emissions - tons/yr	54,200	761,800	712,400	159,100	13,700	700	300	1,160	180	110

However, some measure of the effect of the NSR program can be obtained by considering only: sources that were subject to NSPS; and sources which were not subject to NSPS but had to adopt BACT limits more stringent than those proposed in their original application. For the various pollutants, reductions from "hypothetical" NSPS levels (i.e., those levels at which the source would be allowed to emit if it were just to meet NSPS requirements) and reductions for other sources representing the difference between proposed and final BACT are shown in Table 1-16. These "reductions" expressed as a percentage of the hypothetical/proposed level for the criteria pollutants are:

PM - 17%
SO_2 - 25%
NO_x - 8%
CO - 4%

Expressed as a percentage of the final permitted BACT emissions, these reductions are:

PM - 24%
SO_2 - 33%
NO_x - 8%
CO - 4%

That is, in the absence of the PSD program, PM emissions could have been about one-fourth higher than the permitted PM emissions and SO_2 emissions about one-third higher than the permitted SO_2 emissions.

1.6 ANALYSIS OF AIR QUALITY IMPACTS

Frequency of Air Quality (A/Q) Analyses

Of the 285 data base applications, 213 were required to perform air quality impacts analyses. A total of 451 pollutant specific air quality reviews were performed distributed as shown below:

Pollutant	# of A/Q Reviews	% of Total
PM	90	20
SO_2	124	27
NO_x	163	36
CO	67	15
VOC	3	<1
F	2	<1
H_2S	2	<1
Total	451	100

As shown, NO_x was the pollutant most frequently subject to air quality analyses.

Site specific ambient monitoring was provided in 18% of the PSD applications requiring A/Q analyses. Another 25% of the cases used existing State or other network ambient monitoring data and 57% of the PSD applications requiring A/Q analyses provided no actual ambient air quality monitoring data. In these latter cases, existing ambient air quality was determined by dispersion modeling, assuming approved background concentrations, or some other approved method.

Effects of Allowable PSD Increment Constraints

The most limiting air quality factor was the allowable 24-hour SO_2 increment of 91 ug/m^3. As shown below, except for this factor, very few A/Q analyses predicted that more than 85% of the respective allowable PSD increment would result from the proposed project.

	Pollutant/Increment Averaging Period				
	PM		SO_2		
	24-hr	Annual	3-hr	24-hr	Annual
% of Cases* Where More Than 85% Impact was Predicted	5%	0%	6%	19%	2%

*Based on total number of pollutant specific A/Q analyses.

In many cases where A/Q analyses were required, the applicant did not perform full A/Q analyses because preliminary screening indicated the impacts expected to result from the proposed project were "insignificant."* In some of these cases, due to possible increment violations in the vicinity of the source, a demonstration of "insignificant" impact was required in order to receive a PSD permit. Therefore, those cases where insignificant impacts were indicated does not necessarily mean that a substantial amount of PSD increment was available.

Where PM and SO_2 A/Q analyses were required, project alterations were made in at least 28 cases (13%) to avoid increment violations that could have precluded permit issuance. Those alterations are distributed as shown below:

Alteration	# of Cases	Limiting Factors
1. More Stringent BACT	11	3-hr SO_2 (2); 24-hr SO_2 (7); 24-hr PM (2)
2. Increase Stack Height	5	3-hr SO_2 (1); 24-hr SO_2 (4)
3. Switch to Cleaner Fuel	3	24-hr PM (1); needed insignificance (2)
4. Emission Reductions Elsewhere	3	24-hr SO_2 (3)
5. Limit Hours of Operation	1	Unknown
6. Other	5	Unknown

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* "insignificant" A/Q impact is quantified in the preamble to the 1978 NSR regulations.

Effects of Constraints Caused by National Ambient Air Quality Standards (NAAQS)

The A/Q analyses dealing with NAAQS compliance demonstration did not appear to have had much effect on PSD projects. The most limiting NAAQS was the 24-hour allowable ambient TSP concentration of 150 ug/m^3. As shown below, few A/Q analyses predicted that the proposed projects would result in ambient air quality concentrations that exceeded 90% of the respective NAAQS:

	NAAQS Pollutant/Averaging Period							
	TSP		SO_2			NO_x	CO	
	24-hr	Annual	3-hr	24-hr	Annual	Annual	1-hr	8-hr
% of Cases* Where More Than 90% NAAQS Impacted	9%	0%	3%	3%	0%	2%	0%	0%

*Based on total number of pollutant specific A/Q analyses.

Effect of A/Q Constraints on Emissions Reductions Beyond NSPS

A rough screening analysis was performed to determine reasons for emissions reductions beyond NSPS. For those PSD permits where allowable emissions were below the maximums allowed by the applicable NSPS, the A/Q analyses were evaluated. Based on those evaluations the PM and SO_2 reductions beyond NSPS were distributed among four categories:

- As a result of NAAQS constraints;
- As a result of Increment Constraints;
- As a result of case-by-case BACT; and
- Cause Unknown.

Table 1-17 summarizes that distribution. As shown, it appears that the majority of SO_2 emissions reductions beyond NSPS resulted from increment constraints. Particulate matter emissions reductions beyond NSPS were difficult to categorize because many (about 50%) PM air quality analyses predicted "insignificant" ambient impacts and no estimation of PM increment availability and ambient air quality were provided.

1.7 MISCELLANEOUS ASSOCIATED ANALYSES

As part of this study, certain situations were studied to assess the general effects of existing and alternative provisions of NSR regulations. Presented in this section are the highlights of the more substantive studies.

Effect of Class I Allowable SO_2 Increment on Power Plant Siting

Dispersion modeling of a hypothetical 640 MWe power plant was performed to determine the minimum distance from a Class I area that it can locate without violating the Class I increment. As shown in Table 1-18, if the power plant was allowed to emit SO_2 at .3 lbs/MMBtu and located in flat

Table 1-17. EMISSION REDUCTIONS BEYOND NSPS AND PARTIAL CONTRIBUTIONS BY PROBABLE CAUSE OF THOSE REDUCTIONS
(tons/year)

	As a Result of NAAQS Constraints	As a Result of Increment Constraints	As a Result of Case-by-Case BACT	Unable to Determine Cause*	Total Emission Reductions Beyond NSPS	Total Permitted Emissions for Sources Subject to NSPS
SO_2	36,100	115,500	56,600	10,500	218,700	603,400
PM	0	200	2,300	5,200	7,700	35,200

*Insufficient data to categorize emission reductions.

Table 1-18. EFFECTS OF CLASS I SO_2 INCREMENT ON THE SITING OF A 640 MWe POWER PLANT

Terrain Type	Averaging Period	*Distance of Source from Class I Area Beyond Which SO_2 Increment is not Exceeded		
		Case I: 1.2 lb/MMBtu, 90% SO_2 Removal	Case II: .6 lb/MMBtu, 70% SO_2 Removal	Case III: .3 lb/MMBtu, 70% SO_2 Removal
Flat	24-hour	100	42	19
	Annual	20	0	0
Complex	24-hour	>100	>100	>100
	Annual	91	48	26

terrain, it must locate at least 19 kilometers from the Class I area. The same power plant in complex terrain must locate at a distance of more than 100 kilometers from the Class I area. Higher allowable SO_2 emission rates were also evaluated and the results are shown. In each case, the limiting factor is the allowable 24-hour SO_2 Class I increment.

Effect of Alternative Class I Increment System on Emissions Near Class I Areas

One alternative cited by the National Commission on Air Quality (NCAQ) was to eliminate short term increment tracking in Class I areas and allow a source the entire short term increment. Annual increment tracking would still be retained.

The allowable Class I SO_2 increment was evaluated under this proposal by studying three different cases:

Case 1 - Remote Class I area; little or no industrial activity;

Case 2 - Class I area of moderate industrial activity; two or more closely spaced sources; and

Case 3 - Class I area of heavy industrial activity; numerous sources around a Class I area.

Table 1-19 summarizes the results of this study and impacts on potential emissions change, potential ambient impacts and reduction in air quality dispersion modeling requirements. Generally, there could be a moderate increase in SO_2 emissions and ambient SO_2 concentrations but in some cases, SO_2 emissions could increase by as much as 250% in the area. This would occur when sources were clustered upwind of the impact area.

Cost to Prepare a PSD Application

In conjunction with EPA, a study was performed to determine the approximate range of cost for dispersion modeling supporting a PSD application. This evaluation showed that, in general, dispersion modeling for a PSD application will range from \$10,000 to \$130,000. However, this value could be as low as \$3,000 and as high as \$400,000 or more.

Ten PSD permits were selected representative of data base source categories and locations and the applicants were asked to provide cost data on the preparation of their PSD applications. Table 1-20 summarizes the responses and the costs are broken down into the three most extensive parts of a PSD application:

Table 1-19.

ESTIMATED EFFECTS OF ELIMINATING SHORT-TERM INCREMENT TRACKING

Case	Emissions Change	Air Quality* Impact	Reduction in Required Air Quality Modeling
1	None	None	None
2	0-250% Incr.	24-hr: 0-13 ug/m^3 Incr. annual: 0-1.4 ug/m^3 Incr.	Moderate
3	0-67% Incr.	24-hr: 0-3.6 ug/m^3 Incr. annual: 0-.7 ug/m^3 Incr.	Substantial

*Based on SO_2 emissions

Table 1-20. CASE STUDY OF WORK YEARS AND COST TO PREPARE PSD APPLICATIONS

Source Type	State Where Source is Located	New Source	Modification Type Unit	No. of Pollutants Subject to PSD	Source or Contractor Prepared Application	NAAQS Threatened by Proposed Construction	No. or Models Used to Impact Analysis	No. of Sources Considered in Modeling Analysis	Modeling Costs Higher Due to Modeling More Than Once	Work Years Required for Impact Analysis	Cost of Impact Analysis ($)	Work Years Required for BACT Analysis	Cost of BACT Analysis ($)	Source Required to Conduct Pre-construction Monitoring	Pollutant(s) Monitored by Source	Ambient Monitoring Provided by State Agency	Work Years Required for Air Quality Monitoring Analysis	Cost of Air Quality Monitoring Analysis ($)	Total Work Years Required to Prepare PSD Application	Total Cost of Prepare PSD Application ($)
Chemical Processing	NJ	No	Combustion	3	Source	Yes	2	8	No	0.2	12,800	0.04	2,560	No	NA	Yes	negligible	640	0.25	16,000
Electric Utility	NY	Yes	NA	4	Source	No	2	14	No	1.025	60,400	0.5	39,600	Yes	TSP, SO_2[a]	No	1.6	900,000	3.0	1,000,000
Steel Mill	VA	No	Process	1	Source	No	1	5	No	0.042	3,360	0.013	1,000	No	NA	Yes	negligible	640	0.1	5,000[d]
Electric Utility	FL	Yes	NA	4	Contractor	Yes	4	5	No	1.06	120,530	0.14	10,462	Yes	TSP, SO_2, NO_x, CO, O_3	No	2.4	280,000	4.4	430,000
Fiberglass Mfg.	IN	No	Process	1	Contractor	Yes	3	1	Yes	0.2	15,000	0.04	3,200	No	NA	Yes	negligible	600	0.25	19,000
Coal Preparation	OH	No	Process	1	Contractor	No	1	1	Yes	0.2	23,000[e]	Data not Available	Data not Available	No	NA	Yes	negligible	2,000	0.25	25,000
Chemical Processing	LA	No	Combustion	2	Contractor	No	3	21	No	0.12	10,000	0.065	3,000	No	NA	Yes	0.0[b]	0[b]	0.2	13,000
Portland Cement	TX	No	Fuel Switch	3	Contractor	No	3	20	No	0.09	7,200	0.015	1,200	No	NA	Yes	negligible	40	0.1	8,440
Compressor Station	KS	No	Combustion	1	Source	No	1	1	No	0.04	4,500	0.04	2,300	No	NA	Yes	0.0[b]	0[b]	0.2	6,800
Electric Utility	IN	No	Combustion	2	Source	No	1	11	No	0.25	20,000	0.05	4,000	Yes	TSP, CO	No	0.325	36,000[c]	0.6	60,000

[a] Three SO_2 continuous analyzers were required.

[b] Air Quality Analysis was not required because of rural location of source. $20 \mu g/m^3$ was assumed for background ambient concentration.

[c] Equipment costs were not included because source already owned monitoring equipment.

[d] EPA conducted portions of the analyses in this case.

[e] Survey indicated source chose to change stack height configuration, which required modeling to be redone 3 times. This was not required by EPA.

- Ambient Monitoring;
- Dispersion Modeling; and
- BACT Analyses.

As shown in this table, the cost of a PSD application ranged from about $5,000, where no ambient monitoring and little dispersion modeling was required, to over $1,000,000 where extensive ambient monitoring and dispersion modeling was required. In these cases, ambient monitoring costs were 80-90% of the total PSD application. However, extensive ambient monitoring for a single PSD application is infrequent. Based on Table 1-20 in cases where extensive ambient monitoring is not required, it is probably fair to estimate that an average PSD application may cost between $10,000 and $50,000.

2.0 DATA BASE OF PSD PERMIT APPLICATIONS

2.1 INTRODUCTION

The data base consists of 285 PSD applications sampled from ten EPA regions across the nation. In the years 1978, 1979 and 1980, EPA issued approximately 1100 New Source Review (NSR) permits (about 370 per year). The data base represents approximately 26% of the NSR permits issued during this period.

Data selection criteria, methods used in the analyses of this section, assumptions made in performing the study and other pertinent information are provided in Appendix B. In this section, descriptive statistics are presented for data base source types and project descriptions, pollutant applicability, nonattainment review, emission units, emissions, air quality data, PSD application submittals, and PSD review authority.

2.2 DATA BASE SOURCE TYPES AND PROJECT DESCRIPTIONS

Source Types

The data base consists of 285 PSD applications sampled from the ten EPA regions. Table 2-1 presents a summary of the data base industrial source categories selected in each EPA region. The data base applications are grouped into the "named" 28 PSD sources and "other" PSD sources. The "named" 28 sources are subject to a 100 tons/year major source threshold as defined in the PSD regulations and represent 54% of the data base applications. The "other" source categories are subject to a 250 ton per year major source threshold. Source types with the most representation in the data base are petrochemical and petroleum related sources (108) and electric utilities (39), which constitute approximately 38% and 14% of the data base, respectively. Petrochemical and petroleum related sources include chemical plants, petroleum refineries, natural gas processing plants, and natural gas and crude oil pumping stations.

Table 2-1. DATA BASE PSD APPLICATIONS BY EPA REGION AND SOURCE CATEGORY

	EPA REGION										
Source Category	I	II	III	IV	V	VI	VII	VIII	IX	X	Total
A. Named 28 PSD Sources											
Electric plants with greater than 250 MMBtu/hr heat input	1	1	4	6	5	4	5	5	5	3	39
Coal cleaning plants (with thermal dryers)	0	0	0	0	2	0	0	0	0	0	2
Kraft pulp mills	2	1	1	6	0	1	0	0	0	3	14
Portland cement plants	0	0	0	0	0	2	0	3	0	0	5
Smelters	0	3	2	3	1	0	1	0	0	1	11
Non-metallic mineral process plants	0	0	0	5	2	1	0	0	0	1	9
Carbon black plants	0	0	0	0	0	2	0	0	1	0	3
Chemical plants	1	8	6	9	3	7	1	0	0	1	36
Petroleum refineries	0	1	2	3	0	6	3	1	7	3	26
Other - municipal incinerator, coke oven, fuel conversion, secondary metal, petroleum transfer and glass fiber plants	1	0	2	0	4	1	1	0	0	1	10
Subtotal	5	14	17	32	17	24	11	9	13	13	155
B. Other PSD Sources											
Mining operations	1	3	1	0	1	0	0	2	1	0	9
Asphalt production plants	3	5	4	0	2	0	0	1	1	0	16
Natural gas and crude oil pumping stations	0	0	0	1	4	12	2	11	2	11	43
Natural gas processing plants	0	0	0	0	0	0	0	2	0	1	3
Lumber and wood products manufacturing	4	0	0	1	1	1	0	0	0	1	8
Automotive part manufacturing	0	0	0	1	4	0	2	0	0	0	7
Food processing	0	1	0	4	0	0	0	0	1	0	6
Brewery	0	1	2	0	1	1	0	0	0	0	5
Glass manufacturing	0	0	1	0	1	1	0	0	1	0	4
Municipal incinerators capable of charging less than 250 MMBtu/hr heat input	3	1	0	1	0	0	0	0	0	0	5
Miscellaneous manufacturing/production - computers, electrodes, textiles, fertilizer, salt, kaolin, geothermal power, printing	0	4	1	3	1	0	0	0	2	0	11
Rubber and plastic production plants	0	1	0	2	0	0	0	0	0	0	3
Other - including military bases, laboratories	1	0	4	0	0	0	0	1	2	2	10
Subtotal	12	16	13	13	15	15	4	17	10	15	130
Grand Total	17	30	30	45	32	39	15	26	23	28	285

New Major Sources and Major Modifications

Of the 285 PSD applications in the data base, 215 applications were reviewed under the 1978 PSD regulations. These 215 applications consist of 71 new major sources and 144 major modifications. Seventy applications in the data base were reviewed under the 1980 PSD regulations. These 70 applications consist of 24 new major sources and 46 major modifications. Of the 215 applications reviewed under the 1978 PSD regulations, 161 applications would also be subject to the 1980 PSD regulations. These 161 applications consist of 50 new major sources and 111 major modifications. The combination of applications reviewed under the 1980 PSD regulations and those applications reviewed under the 1978 PSD regulations which would be subject to the 1980 PSD regulations, is 231 applications (161 + 70 = 231).

Project Descriptions

Project descriptions have been classified into new major source construction, and major modifications with additions of combustion units, process units, fuel switches, or all combinations of the above. Project descriptions for the 285 data base applications are as follows:

Project Descriptions	Number of Applications	Percent of Total Applications
New source construction	95	33%
Modification of an existing source: additional combustion emission units only added	80	28%
Modification of an existing source: additional process emission units only added	69	24%
Modification of an existing source: fuel switch at existing emission units only	5	2%
Modification of an existing source: additional process and combustion emission units added	33	12%
Modification of an existing source: additional process, combustion emission units added and fuel switch at existing emission units	3	1%
Total	285	100%

Modifications involving fuel switches are categorized as "additional combustion emissions units" if the existing combustion units were unable to accommodate the fuel switch and were replaced by new units.

2.3 POLLUTANT APPLICABILITY

Shown below is the percent of data base applications reviewed under the 1978 and 1980 PSD regulations by the number of pollutants reviewed per application:

	Number of Pollutants Reviewed Per Application					
	1	2	3	4	5	6
% of applications reviewed under 1978 PSD regulations	48%	20%	12%	12%	8%	0%
% of applications reviewed under 1980 PSD regulations	20%	20%	26%	26%	7%	1%

Data base applications subject to the 1980 PSD regulations have more pollutants subject to review per application than those applications subject to the 1978 PSD regulations. This trend can be correlated with the applicability criteria of the 1980 PSD regulations which generally tend to require more individual reviews of pollutants than the 1978 PSD regulations.

2.4 NONATTAINMENT REVIEW

Thirty-five (35) data base applications were found to be subject to simultaneous PSD and nonattainment review. Fourteen (14) of these 35 applications were subject to nonattainment review for more than one pollutant. In the 35 applications the number of nonattainment reviews by pollutant are as follows:

Pollutant	# of nonattainment pollutant reviews
PM	15
SO_2	6
NO_x	3
CO	6
VOC	26
Total	56

2.5 DATA BASE EMISSION UNITS

The data base consists of 1,126 individual emission units of which 1,025 are new emission units. Emission units were categorized as combustion emission units, process emission units, or both and represent 56%, 32%, and 12% of the data base emission units, respectively. Examples of emissions units that are both a combustion and a process emissions unit are: kilns, dryers, and fluid catalytic cracking units (FCCU).

2.6 DATA BASE EMISSIONS SUMMARY

Table 2-2 presents an emissions summary of PM, SO_2, NO_x, CO and VOC emissions from all sources in the data base. Examination of Table 2-2 shows that SO_2 has the highest total net increase of any pollutant in the data base. Also, CO and VOC have a total net decrease in emissions after emissions reductions are included. The large emissions reductions of CO and the majority of the emissions reductions of VOC are the result of two modifications to existing carbon black plants. These modifications consist of the utilization of process gas as fuel. In the past, process gas was emitted directly to the atmosphere by these sources.

Most emissions limitations in PSD permits are a result of case-by-case application of either Best Available Control Technology (BACT) for "attainment" pollutants or Lowest Achievable Emission Rate (LAER) for "nonattainment" pollutants. In some cases, however, emission limitations in permits reflect administrative requirements and are not a result of case-by-case control technology review. Those data base emissions that resulted from either BACT or LAER review are presented in Table 2-2 as "BACT and LAER permitted emissions".

2.7 AIR QUALITY DATA

Data base applications subject to air quality review for at least one pollutant include 144 (67 percent) of the applications subject to the 1978 PSD regulations and 69 (98 percent) of the applications subject to the 1980 PSD regulations.

There are 71 data base applications reviewed under the 1978 PSD regulations for which no air quality reviews were performed. A "Tier 1" review was required for 49 of these applications. This review applied to those cases where gross increases in allowable emissions were less

Table 2-2. EMISSIONS SUMMARY OF PM, SO_2, NO_x, CO and VOC EMISSIONS FROM ALL DATA BASE APPLICATIONS

	Net Emissions Changes (tons/year)	BACT and LAER Permitted Emissions
Pollutant		
PM	57,000	57,000
SO_2	722,000	777,000
NO_x	709,000	713,000
CO	-107,000[a]	162,000
VOC	-13,000[b]	16,000

[a] This value includes emissions reductions of 299,000 tons/year of CO from two carbon black plants.

[b] This value includes emission reductions of 22,000 tons/year of VOC from one carbon black plant and one kraft pulp mill.

than 50 tons per year for each pollutant subject to PSD (see Appendix A). Contingent upon a demonstration of no adverse air quality impact and no impact upon Class I areas or known increment violations, "Tier 1" review exempted these sources from the Best Available Control Technology (BACT), additional impacts, and air quality requirements. However, these sources were required to meet all applicable New Source Performance Standards (NSPS) and State Implementation Plan (SIP) requirements.

Twelve (12) data base applications for which no air quality reviews were required were reviewed for Best Available Control Technology (BACT) only. This review applied to those cases where gross increases in allowable emissions exceeded 50 tons per year and emissions reductions at the source equalled or exceeded the allowable emissions increases associated with the proposed project. Six applications were subject to PSD review solely for VOC emissions which, due to the lack of accurate ozone air quality prediction techniques, do not generally require full air quality review.

The basis for the air quality review exemptions of the remaining four data base applications was not determined.

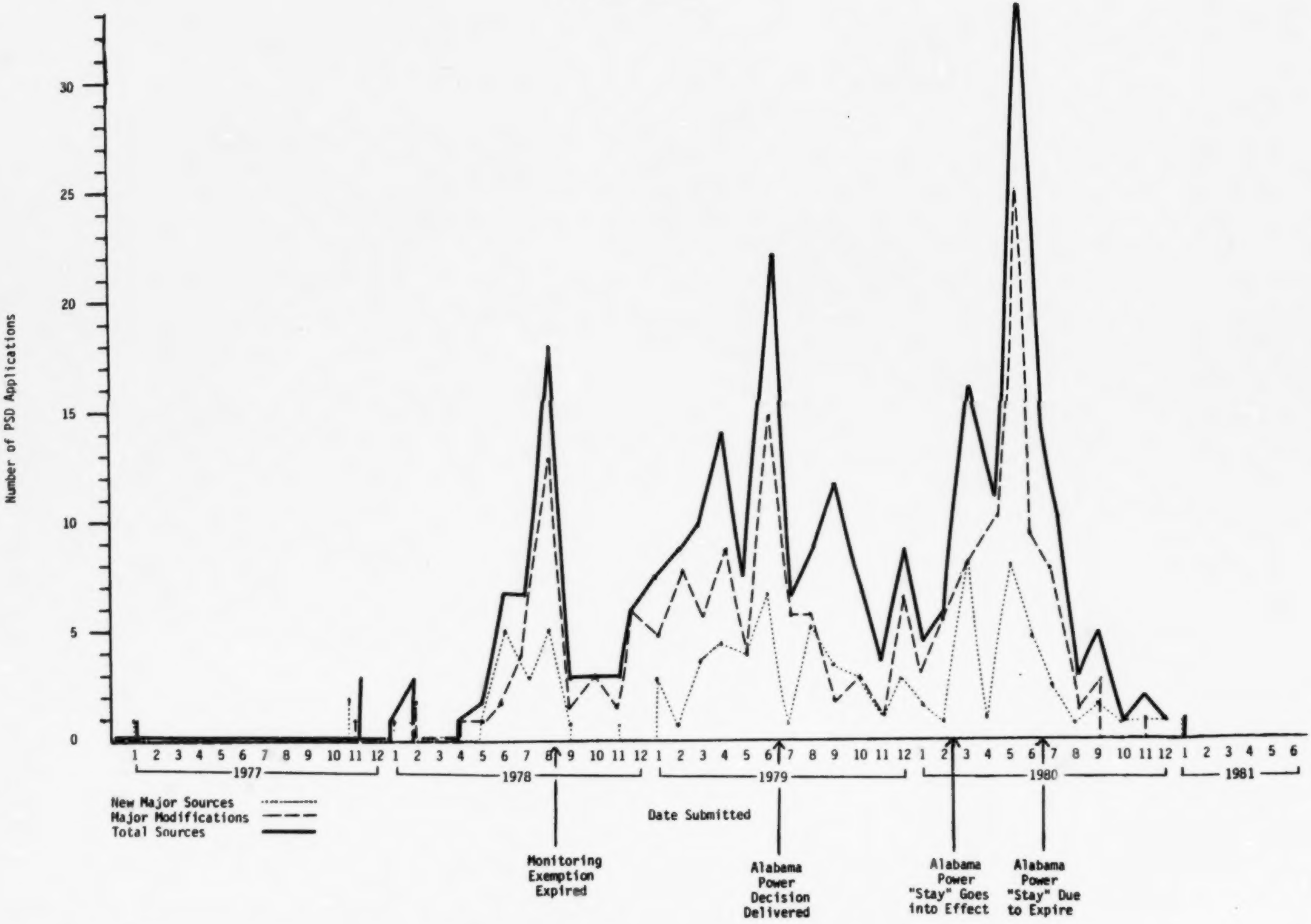
For those 213 data base applications subject to an air quality review, about 21 percent used five years or more of meteorological data in the dispersion modeling analyses.

2.8 PSD APPLICATION SUBMITTALS

Figure 2-1 presents a chronology of data base PSD application submittals by the month the application was submitted. The earliest application in the data base was submitted in January of 1977. The latest application was submitted in January of 1981. It appears that "surges" in the number of application submittals occurred at times of major regulatory changes in the new source review program. These surges occur in the time frames corresponding to July - August, 1978 (prior to the date on which sources subject to PSD were required to provide monitoring data as part of the requirements to obtain a PSD permit), June 1979 (prior to the date of the preliminary Alabama Power decision), and March, April and May 1980 after the February 6, 1980 "stay" of PSD regulations and prior to its anticipated expiration date of June 6, 1980.

Figure 2-1.

CHRONOLOGY OF DATA BASE
PSD APPLICATION SUBMITTALS
(By Month Submitted)



2.9 PSD REVIEW AUTHORITY

All data base applications were categorized as having been reviewed for technical content by one of the three types of reviewers: the EPA, State agency or contractor assisting either the EPA or the State. Of the 285 PSD applications, 197 were reviewed by the EPA, 34 were reviewed by the State, and 54 were reviewed by contractors.

3.0 PSD PERMIT PROCESSING TIMES

3.1 INTRODUCTION

An analysis of the data base applications was performed to determine the ranges and average times involved in processing PSD applications. Additionally, factors such as source size, date of application submittal and pre-application contact were considered in an attempt to determine causes of permitting delays. The methods and assumptions used to produce the analytic results of this section are presented in Appendix C.

The necessary time to obtain a PSD permit involves both the time for industry to develop a complete application and the time for the reviewing authority to process it. There are four distinct stages of the permitting process:

1. Application preparation and submittal;
2. Agency review for "completeness";
3. Preliminary determination, draft permit preparation and public comment period; and
4. Final permit issuance.

The time to process a PSD application through the latter three stages forms the basis for the analyses of this section.

It must be pointed out that a potential bias caused by the methods used to collect PSD applications for inclusion into the data base (described in detail in Appendix B) may influence permit processing time analyses. Selected data consist of the most recent PSD permits issued on file in each EPA regional office and were collected by reverse chronological order of permit issuance. The selection criterion ignores the dates of application submittals for these permits. Those PSD applications that were submitted in the early stages of the 1978 PSD regulations and experienced relatively short processing times would not have been incorporated in the data base. Similarly, those PSD applications in various permit processing stages at the time of data gathering (February, March, April and August, 1981) were also excluded from the data base. It is difficult to determine whether the combined effects of these factors would indeed influence permit processing time analyses. However, the sampling method and associated potential bias preclude the ability to accurately characterize historical trends in processing times. Therefore, the reader must recognize that analyses of permit processing times are characteristic of the data base (most recent permits) and not necessarily the entire NSR program.

3.2 SUMMARY OF PSD PERMIT PROCESSING TIMES

Total Processing Time

Table 3-1 summarizes the total processing time by EPA region (from initial application submittal to permit issuance) of all data base applications. Processing times averaged 11.0 months. As shown on Table 3-1, the average processing time by application reviewer (EPA, State, local agency, or contractor) varied between 10.5 months for EPA personnel to 12.9 months for contractors. Based on the limited amount of data for contractor and State agency reviews, it does not appear that processing times were greatly influenced by reviewer affiliation. PSD permit processing time varied widely among data base applications. The time between initial application submittal and permit issuance ranged from 1.4 to 51.3 months.

As shown in Figure 3-1, 25% of the data base permits were processed within 6 months; 68% within one year; and 88% within 18 months from the time of initial submittal. These values do not reflect any comparison to the statutory one year processing requirement from date of receipt of complete application.

Application Completeness

At the time a PSD permit application is determined "complete", the review authority usually has all the information necessary to make a permitting decision. Figure 3-2 shows the distribution of the processing times between initial application submittal and determination of a complete application by one month intervals. Sixty-six (23%) data base applications were deemed officially "complete" upon initial application submittal. The remainder (219) were required to submit additional information for this determination. In three cases, this required more than two years from the date of initial submittal.

Table 3-1. SUMMARY OF PSD PERMIT PROCESSING TIME (INITIAL APPLICATION SUBMITTAL TO PERMIT ISSUANCE) BY EPA REGION AND APPLICATION REVIEWER

	PSD Application Reviewer								
	EPA Personnel		State Agency Personnel		Contractors				
EPA Region	No. of Applications Reviewed	Average Processing Time (months)	No. of Applications Reviewed	Average Processing Time (months)	No. of Applications Reviewed	Average Processing Time (months)	Total Permits Issued	Overall Average Processing Time (months)	Range of Processing Time (months)
1	17	8.0	0	N/A	0	N/A	17	8.0	2.9 - 15.3
2	30	9.8	0	N/A	0	N/A	30	9.8	1.4 - 20.8
3	29	11.6	0	N/A	1	6.5	30	11.4	3.6 - 37.7
4	1	4.6	33	10.3	11	13.9	45	11.1	2.9 - 32.1
5	32	11.9	0	N/A	0	N/A	32	11.9	4.9 - 24.6
6	0	N/A	0	N/A	39	13.9	39	12.4	5.7 - 37.5
7	15	14.6	0	N/A	0	N/A	15	14.6	2.2 - 31.6
8	24	8.9	0	N/A	2	22.8	26	9.9	3.5 - 27.5
9	21	11.1	1	26.9	1	9.3	23	11.7	2.6 - 51.3
10	28	9.4	0	N/A	0	N/A	28	9.4	3.0 - 19.5
TOTAL	197		34		54		285		
OVERALL AVERAGE PROCESSING TIME (MONTHS)		10.5		10.8		12.9		11.0	
RANGE OF PROCESSING TIME (MONTHS)		1.4 - 51.3		2.9 - 32.1		3.8 - 37.5			1.4 - 51.3

FIGURE 3-1. DISTRIBUTION OF PERMIT PROCESSING TIMES BY 6 MONTH INTERVALS.

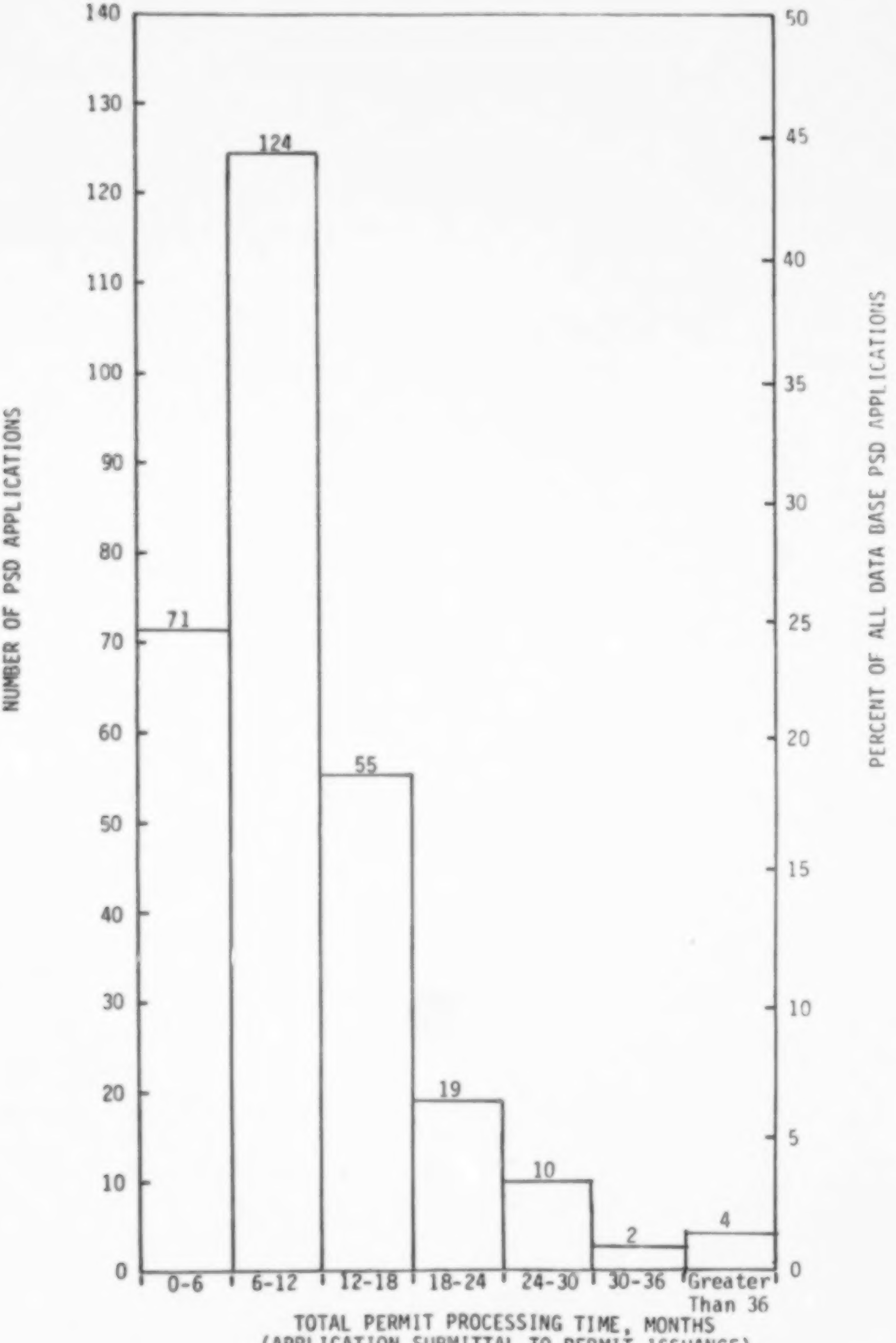
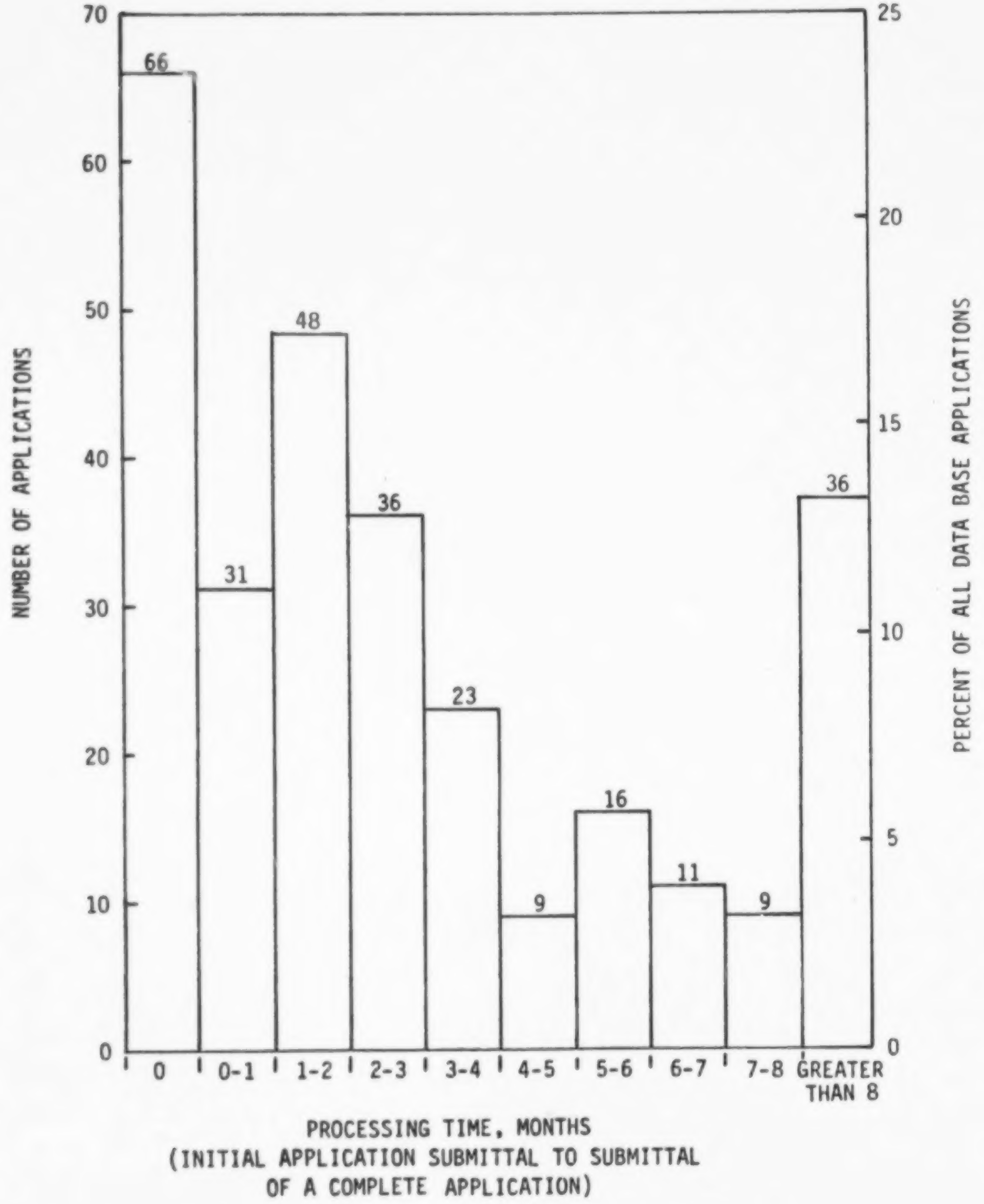


FIGURE 3-2. DISTRIBUTION OF THE PROCESSING TIME BETWEEN INITIAL APPLICATION SUBMITTAL AND SUBMITTAL OF A COMPLETE APPLICATION BY 1 MONTH INTERVALS.



As shown below, the percent of PSD applications that were considered complete upon initial submittal varied among regions from 0% to 52%.

EPA Region	Total Number of Data Base Applications in Region	Applications Determine "Complete" Upon Initial Submittal	
		Number	% in Region
I	17	0	0
II	30	11	37
III	30	1	3
IV	45	18	40
V	32	1	3
VI	39	5	13
VII	15	1	7
VIII	26	10	37
IX	23	12	52
X	28	7	26

Table 3-2 displays a summary of PSD permit processing times from initial application submittal to determination of a complete application by EPA region and reviewer. By region, the overall average processing time for this determination ranged from 1.7 months to 8.1 months. Individual application processing times ranged from 0 to 47.1 months. Due to the limited number of applications reviewed by a State agency or contractor, there is no evidence of large differences in processing times by application reviewer.

Permit Processing Time from Receipt of a Complete Application

Figure 3-3 shows the distribution of the processing time between submittal of a complete application and permit issuance by six month intervals. It can be seen that almost 90% of the data base applications were processed within one year of submittal of a "complete" application.

Table 3-3 presents a summary of PSD permit processing times from submittal of a complete application to permit issuance by EPA region and reviewer. By region, permit processing time from receipt of a complete application averaged 7.2 months and ranged from 5.6 to 9.3 months. The individual application processing times ranged from 1.4 to 28.8 months.

Table 3-2. SUMMARY OF PSD APPLICATION COMPLETENESS DETERMINATION TIME (INITIAL APPLICATION SUBMITTAL TO SUBMITTAL OF A COMPLETE APPLICATION) BY EPA REGION AND APPLICATION REVIEWER

	PSD Application Reviewer								
	EPA Personnel		State Agency Personnel		Contractors				
EPA Region	No. of Applications Reviewed	Average Time (months)	No. of Applications Reviewed	Average Time (months)	No. of Applications Reviewed	Average Time (months)	Total Permits Issued	Overall Average Time (months)	Range of Time (months)
1	17	1.7	0	N/A	0	N/A	17	1.7	.3 - 6.6
2	30	3.5	0	N/A	0	N/A	30	3.5	0 - 16.9
3	29	3.2	0	N/A	1	1.6	30	3.1	0 - 8.7
4	1	0	33	2.5	11	5.3	45	3.1	0 - 25.9
5	32	5.5	0	N/A	0	N/A	32	5.5	0 - 22.0
6	0	N/A	0	N/A	39	3.1	39	3.1	0 - 14.7
7	15	8.1	0	N/A	0	N/A	15	8.1	0 - 24.8
8	24	3.2	0	N/A	2	18.0	26	4.4	0 - 22.9
9	21	4.3	1	22.0	1	4.1	23	5.1	0 - 47.1
10	28	2.3	0	N/A	0	N/A	28	2.3	0 - 7.6
TOTAL	197		34		54		285		
OVERALL AVERAGE PROCESSING TIME (MONTHS)		3.9		3.1		4.1		3.8	
RANGE OF PROCESSING TIME (MONTHS)		0 - 47.1		0 - 22.1		0 - 25.9			0 - 47.1

FIGURE 3-3. DISTRIBUTION OF THE PROCESSING TIME BETWEEN SUBMITTAL OF A COMPLETE APPLICATION AND PERMIT ISSUANCE BY 6 MONTH INTERVALS.

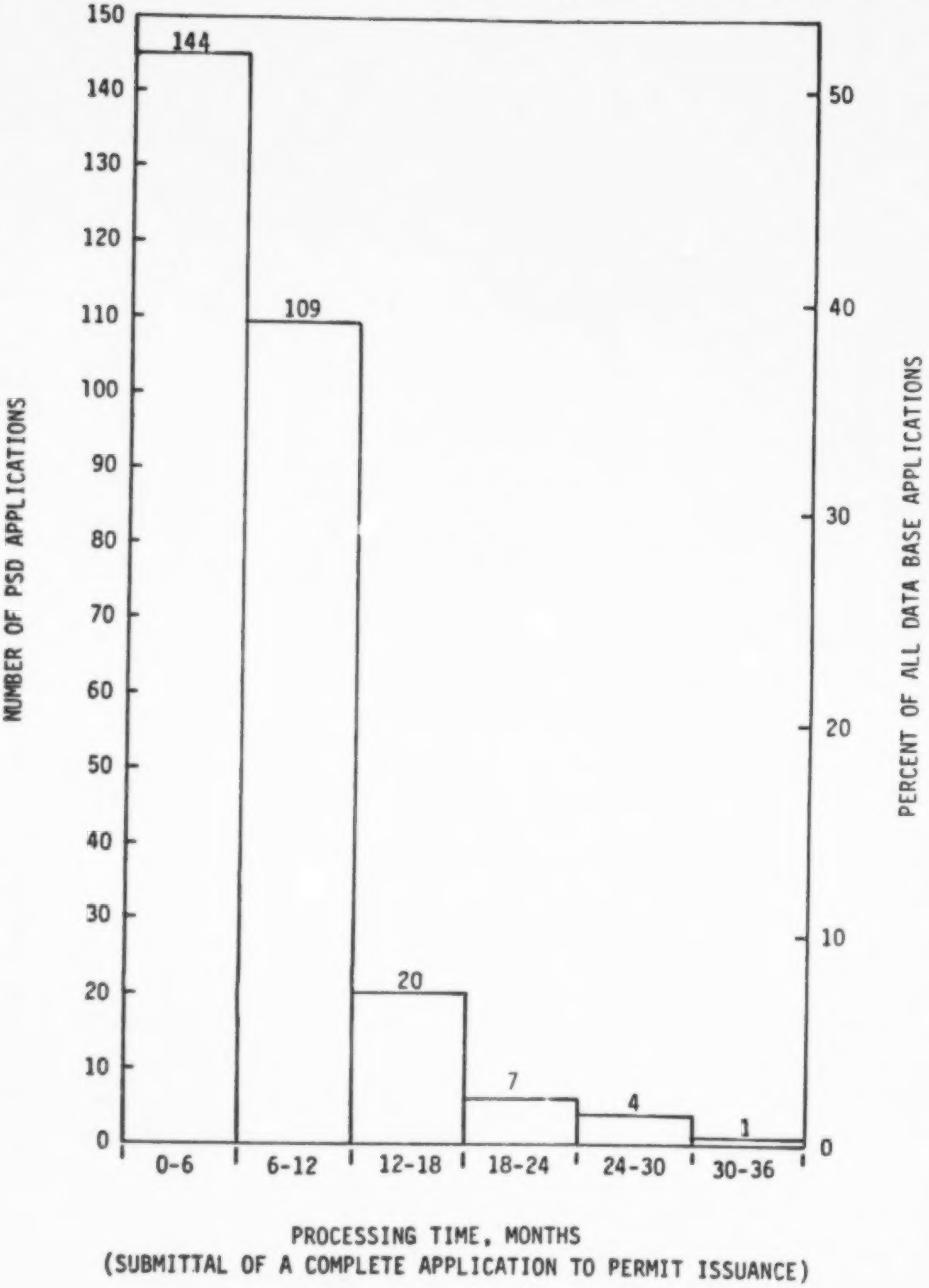


Table 3-3. SUMMARY OF PSD PERMIT PROCESSING TIME (SUBMITTAL OF A COMPLETE APPLICATION TO PERMIT ISSUANCE) BY EPA REGION AND APPLICATION REVIEWER

	PSD Application Reviewer								
	EPA Personnel		State Agency Personnel		Contractors				
EPA Region	No. of Applications Reviewed	Average Processing Time (months)	No. of Applications Reviewed	Average Processing Time (months)	No. of Applications Reviewed	Average Processing Time (months)	Total Permits Issued	Overall Average Processing Time (months)	Range of Processing Time (months)
1	17	6.3	0	N/A	0	N/A	17	6.3	2.6 - 14.4
2	30	6.3	0	N/A	0	N/A	30	6.3	1.4 - 15.8
3	29	8.4	0	N/A	1	4.9	30	8.3	2.2 - 32.4
4	1	4.6	33	7.9	11	8.6	45	8.0	1.6 - 28.8
5	32	6.3	0	N/A	0	N/A	32	6.3	2.1 - 12.5
6	0	N/A	0	N/A	39	9.3	39	9.3	3.0 - 22.8
7	15	6.5	0	N/A	0	N/A	15	6.5	1.6 - 12.7
8	24	5.6	0	N/A	2	4.8	26	5.6	2.1 - 18.3
9	21	6.7	1	4.9	1	5.2	23	6.6	2.6 - 26.6
10	28	7.1	0	N/A	0	N/A	28	7.1	2.1 - 13.2
TOTAL	197		34		54		285		
OVERALL AVERAGE PROCESSING TIME (MONTHS)		6.7		7.8		8.8		7.2	
RANGE OF PROCESSING TIME (MONTHS)		1.4 - 26.6		1.6 - 26.5		2.2 - 28.8			1.4 - 28.8

3.3 COMPONENTS OF PSD PERMIT PROCESSING TIME BY PERIOD OF APPLICATION SUBMITTAL

Table 3-4 presents the primary components of PSD permit processing time by date of application submittal. The data are presented in six-month block periods according to the dates of application submittal. The date of determination of submittal of a complete application was the date recorded in the "official" EPA log book as "complete". In addition to the "official" completeness date, the date of the last substantive information submitted by the applicant was obtained and coded as the date of "last information submittal".

Examination of the relationships between the components of PSD processing time presented in Table 3-4 show the following trends:

1. The time between initial application submittal and determination of a "complete" application generally coincides with the time between initial application submittal and last information submittal;
2. Since December 1978, it appears that the permit processing time from receipt of a complete application has averaged about six months.

3.4 EFFECT OF SOURCE SIZE AND TYPE ON PROCESSING TIMES

An analysis was conducted to correlate permit processing time with source size and type. Table 3-5 presents the distribution of permit processing times (initial application submittal to permit issuance) for utility and non-utility applications. An examination of the table shows that 28% of non-utility applications were processed in less than six months, whereas only 5% of utility applications were processed in that time period. Furthermore, 57% of utility applications required more than one year to process, whereas, 28% of non-utility applications required more than one year. Based only on this data, utility applications are shown to require longer permit processing times than non-utility applications.

Table 3-6 presents the distribution of permit processing times (initial application submittal to permit issuance) for new major source and major modification applications. This table shows that 23% of major modifications required less than six months to process and 28% of new major sources required less than six months. Also, 34% of new major sources required greater than one year to process and 31% of major

Table 3-4. COMPONENTS OF PSD PERMIT PROCESSING TIME BY SIX-MONTH PERIODS OF APPLICATION SUBMITTAL

Period of PSD Application Submittal	Average Time Between Application Submittal and Determination of a Complete Application (Months)	Average Time Between Application and Last Information Submittal (Months)	Average Time Between Last Information Submittal and Permit Issuance (Months)
Jan 1977 - Jun 1977	47.1	47.3	4.0
Jul 1977 - Dec 1977	13.3	10.4	13.3
Jan 1978 - Jun 1978	10.0	11.1	8.3
Jul 1978 - Dec 1978	7.3	7.9	9.7
Jan 1979 - Jun 1979	2.7	2.6	6.0
Jul 1979 - Dec 1979	2.4	3.7	6.0
Jan 1980 - Jun 1980	2.4	3.4	6.1
Jul 1980 - Dec 1980	1.1	1.5	4.5
Jan 1981 - Jun 1981	1.5	1.5	3.6
Average	3.8	4.4	6.6

Table 3-5. DISTRIBUTION OF DATA BASE PERMIT PROCESSING TIMES FOR UTILITY AND NON-UTILITY APPLICATIONS BY SIX MONTH INTERVALS (INITIAL APPLICATION SUBMITTAL TO PERMIT ISSUANCE)

Processing Time (months)	Utility Applications		Non-Utility Applications	
	Number	Percent	Number	Percent
0-6	2	5	69	28
6-12	15	38	109	44
12-18	8	21	47	19
18-24	6	15	13	5
24-30	5	13	5	2
30-36	2	5	2	1
36-42	0	0	1	<1
42-48	1	3	0	0
Total	39	100	246	100
Range of Processing Times (months)	4.5-51.3		1.4-37.7	

Table 3-6. DISTRIBUTION OF DATA BASE PERMIT PROCESSING TIMES FOR NEW MAJOR SOURCES AND MODIFICATIONS BY SIX MONTH INTERVALS (INITIAL APPLICATION SUBMITTAL TO PERMIT ISSUANCE)

Processing Time (months)	New Major Sources		Major Modifications	
	Number	%	Number	%
0-6	27	28	44	23
6-12	36	38	88	46
12-18	15	16	40	21
18-24	12	13	7	4
24-30	3	3	7	4
30-36	0	0	2	1
36-42	1	1	2	1
42-48	1	1	0	0
Total	95	100	190	100
Range of Processing Times (months)	2.2-51.3		1.4-38.4	

modifications required greater than one year. Based on this data, no distinction can be made between the permit processing times of new major sources and major modifications.

An analysis to correlate source size with processing time was made for both new sources and modifications. The analysis showed a direct relationship between the length of application processing time and the amount of pollutant increase (ton/yr) for major modifications. This relationship indicates that for major modifications, the greater the increase in pollutant emissions, the longer the permit processing time. This same relationship was not found to be true for new sources.

3.5 EFFECT OF PRE-APPLICATION CONTACT ON PROCESSING TIMES

For applications submitted in 1978, 1979 and 1980, those that were preceded by meetings or similar contact between the applicant and the reviewing authority appear to have experienced shorter total permit processing times than those that did not. Table 3-7 shows that this difference averaged 7.5 months in the second half of 1978 and 0.8 months in the first half of 1980. The table also shows this difference to gradually disappear in 1980. This may indicate that pre-application contacts were beneficial at the inception of the PSD program, but as people became more aware of the regulations and procedures, pre-application contact diminished in value as far as processing times are concerned. A survey of EPA regional office files shows that about 30% of the data base permits submitted in 1978, 1979 and 1980, involved pre-application contact between the applicant and the reviewing authority.

3.6 PERMIT PROCESSING TIMES FOR APPLICATIONS SUBJECT TO BOTH PSD AND NONATTAINMENT REVIEW

An analysis of permit processing involving both PSD and nonattainment review is based on 23 applications. Of these 23 applications, the total permitting time required to obtain both permits ranged from 3.5 to 37 months, with an average total permitting time of 14.4 months. Total permitting times were defined as the period between submittal of the first application (PSD or nonattainment) and the issuance of the last permit (PSD or nonattainment). Because of dual permitting requirements, 11 of the 23 applications (48%) experienced extended permit review beyond the time required to obtain only

Table 3-7. COMPARISON OF AVERAGE PERMIT PROCESSING TIMES FOR PSD PERMIT APPLICATIONS WITH AND WITHOUT PRE-APPLICATION MEETINGS

	No. of Permits With Pre-submittal Contact	Average Time Span Between Pre-submittal Contact and Final Permit (months)	Average Permitting* Time (months) for Sources With Pre-submittal Contact	No. of Permits Without Pre-submittal Contact	Average Permitting Time* (months) for Sources Without Pre-submittal Contact
1st half 1978	2	14.0	11.0	7	23.9
2nd half 1978	8	16.0	11.0	24	18.5
1st half 1979	14	10.5	7.3	30	7.8
2nd half 1979	17	12.0	7.6	19	9.5
1st half 1980	10	12.2	8.6	43	9.4
2nd half 1980	2	8.0	7.0	18	7.0

*From application submittal to final permit.

the PSD permit. The portion of the total permitting period attributed to the dual permitting requirement was calculated by subtracting the PSD permitting period (PSD application submittal to PSD permit issuance) from the total permitting period. The time attributable to the dual permitting requirement for these 11 applications ranged from 0.3 to 5 months, with a 2.4 month average. However, if all 23 applications were considered, the range of extra permitting time due to nonattainment review would be 0 to 5 months.

4.0 ANALYSIS OF PSD AND NONATTAINMENT REVIEW APPLICABILITY

4.1 INTRODUCTION

This section presents an assessment of alternative PSD and nonattainment review applicability criteria and its effects on the number of new sources, modifications, and amounts of pollutants subject to review. The analyses focus on: distribution of criteria pollutant emissions; pollutant reviews and emissions coverage at various thresholds; and permit applications eliminated from review at various thresholds. The methods and assumptions used in the analyses of this section are presented in Appendix D.

All PSD applications in the data base are subject to either the 1978 or 1980 PSD regulations. These two PSD regulations are complicated and have different applicability and regulatory requirements. A general description of these regulations is contained in Appendix A. A knowledge of the differences between the applicability requirements of the 1978 and 1980 PSD regulations is recommended for understanding the analyses of this section.

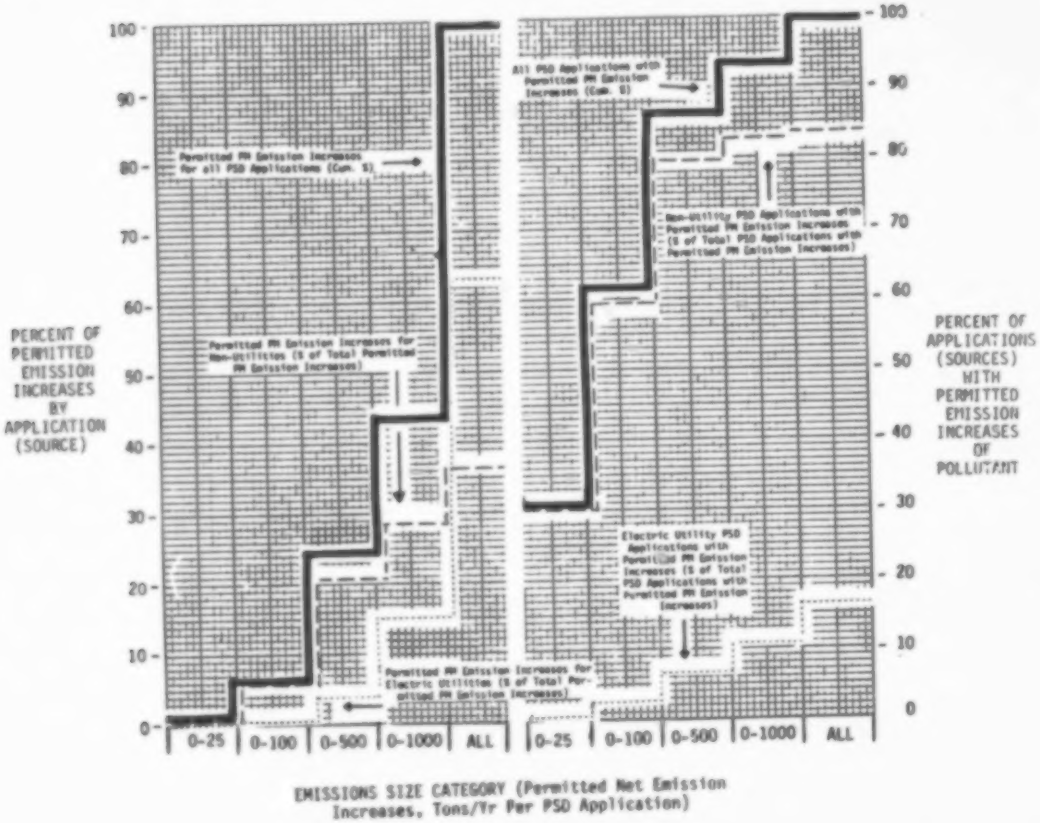
4.2 DISTRIBUTION OF CRITERIA POLLUTANT EMISSIONS

Figures 4-1 through 4-5 show the distribution of data base net emission increases of PM, SO_2, NO_x, CO and VOC emissions, respectively. The data are categorized into size classes according to the magnitude of the net emissions increase of each PSD application. The data are presented for electric utilities, all other source types (non-utilities) and summed for all sources.

The data in Figures 4-1 through 4-5 consider only those PSD applications that indicated "net emissions increases" of the respective pollutant. The data base PSD applications that indicated "net emissions decreases" for the pollutant were omitted in order to reflect the 1980 PSD applicability criteria since source wide net emissions decreases are not subject to review under the 1980 PSD regulations. In fact, one data base PSD application involved a net CO emissions decrease of 200,000 tons per year. Another PSD application involved a net VOC

Figure 4-1. DISTRIBUTION OF PERMITTED EMISSION INCREASES BY APPLICATION (SOURCE) SIZE (INCLUDING NET PSD EMISSIONS AND GROSS LAER EMISSIONS)*

POLLUTANT: PARTICULATE MATTER (PM)



Note: Emission unit size categories in Figure are cumulative whereas they are discrete in Table.

Emissions Size Category (Permitted Net Emission Increases, Tons/Yr Per PSD Application)	Permitted Emission Increases (% of Total)			Applications (Sources) with Permitted Emission Increases of Pollutant (% of Total)		
	Utility	Non-utility	Total[1]	Utility	Non-utility	Total[2]
0 - 25	<.1	1.1	1.1	.5	30.1	30.6
25 - 100	.5	4.8	5.3	1.8	29.2	31.0
100 - 500	3.2	14.5	17.7	4.1	20.4	24.5
500 - 1000	11.3	8.1	19.4	4.2	3.2	7.4
>1000	48.4	8.1	56.5	5.6	.9	6.5
TOTAL	63.4	36.6	100	16.2	83.8	100

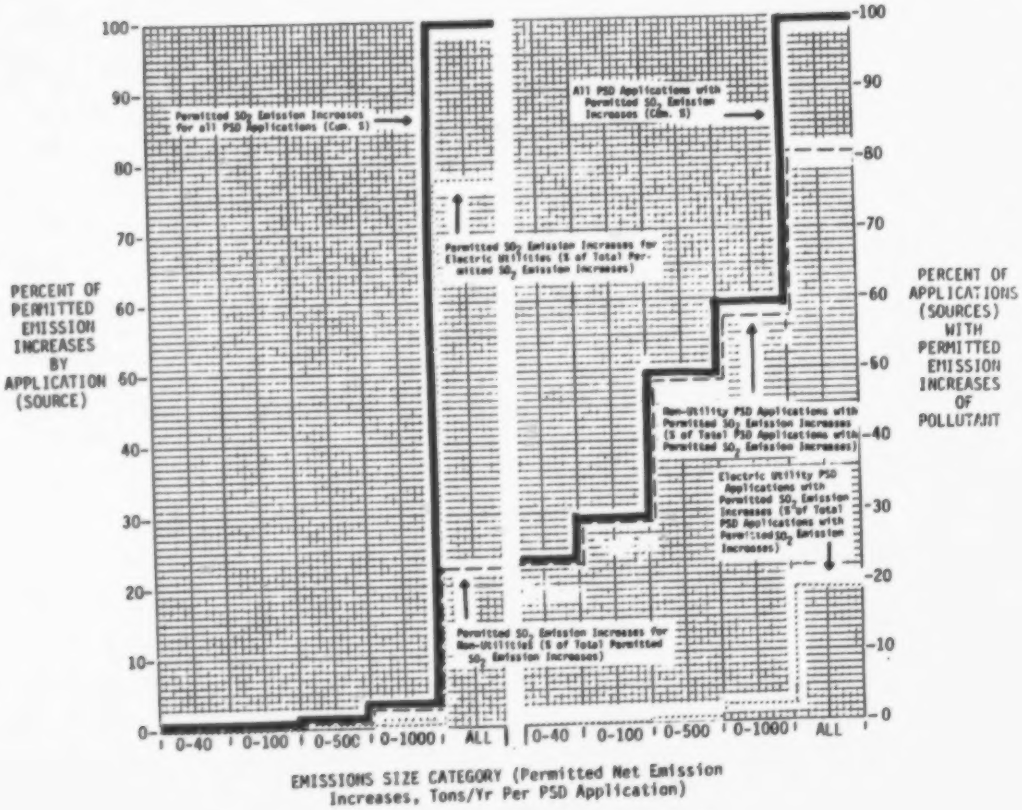
[1] Sum of PM net emission increases for all data base applications = 62.0 M tons/year.

[2] Total number of data base applications with permitted net emission increases of PM = 216.

*Data base applications with permitted net decreases of PM are not included in the construction of this figure.

Figure 4-2. DISTRIBUTION OF PERMITTED EMISSION INCREASES BY APPLICATION (SOURCE) SIZE (INCLUDING NET PSD EMISSIONS AND GROSS LAER EMISSIONS)*

POLLUTANT: SULFUR DIOXIDE (SO_2)



Note: Emission unit size categories in Figure are cumulative whereas they are discrete in Table.

Emissions Size Category (Permitted Net Emission Increases, Tons/Yr Per PSD Application)	Permitted Emission Increases (% of Total)			Applications (Sources) with Permitted Emission Increases of Pollutant (% of Total)		
	Utility	Non-utility	Total[1]	Utility	Non-utility	Total[2]
0 - 40	0	<.1	<.1	0	23.2	23.2
40 - 100	0	.1	.1	0	5.9	5.9
100 - 500	<.1	1.4	1.4	.5	19.5	20.0
500 - 1000	.3	1.6	1.9	1.6	8.7	10.3
>1000	77.1	19.5	96.6	16.8	23.8	40.6
TOTAL	77.4	22.6	100	18.9	81.1	100

---

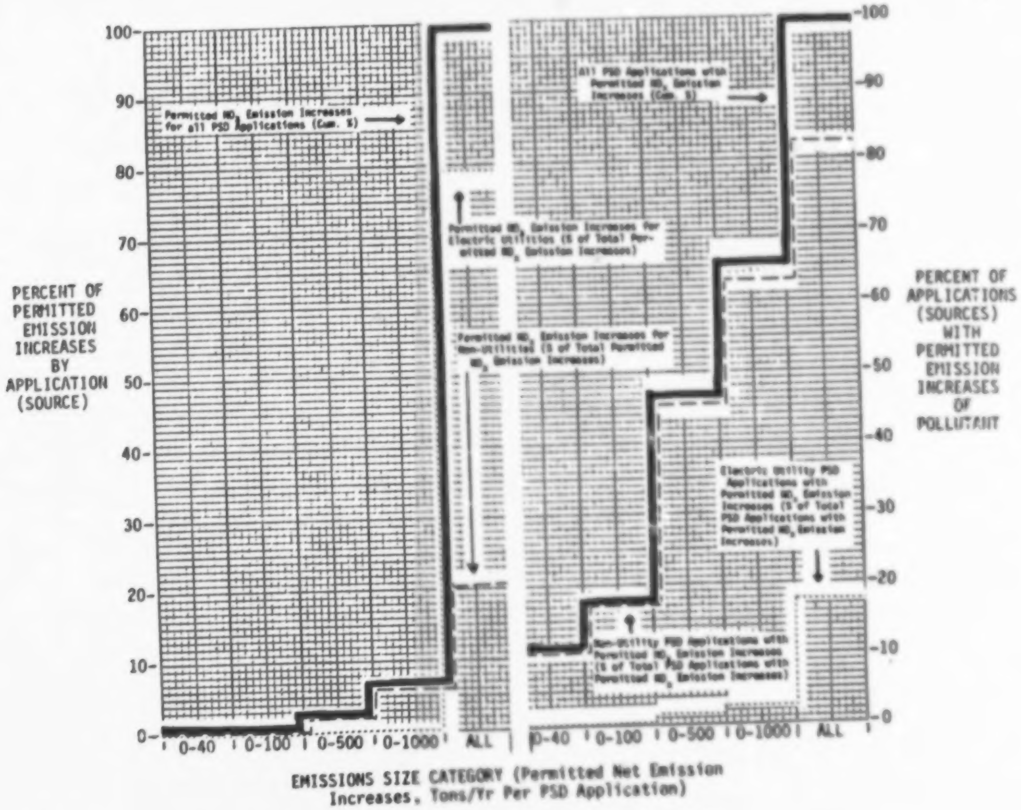
[1] Sum of SO_2 net emission increases for all data base applications = 732.7 M tons/year.

[2] Total number of data base applications with permitted net emission increases of SO_2 = 185.

*Data base applications with permitted net decreases of SO_2 are not included in the construction of this figure.

Figure 4-3. DISTRIBUTION OF PERMITTED EMISSION INCREASES BY APPLICATION (SOURCE) SIZE (INCLUDING NET PSD EMISSIONS AND GROSS LAER EMISSIONS)*

POLLUTANT: NITROGEN OXIDES (NO_x)



Note: Emission unit size categories in Figure are cumulative whereas they are discrete in Table.

Emissions Size Category (Permitted Net Emission Increases, Tons/Yr Per PSD Application)	Permitted Emission Increases (% of Total)			Applications (Sources) with Permitted Emission Increases of Pollutant (% of Total)		
	Utility	Non-utility	Total[1]	Utility	Non-utility	Total[2]
0 - 40	0	<.1	<.1	0	10.9	10.9
40 - 100	0	.1	.1	0	6.2	6.2
100 - 500	.1	2.1	2.2	1.4	28.4	29.8
500 - 1000	.2	3.6	3.8	.9	17.6	18.5
>1000	79.1	14.7	93.8	15.2	19.4	34.6
TOTAL	79.4	20.6	100	17.5	82.5	100

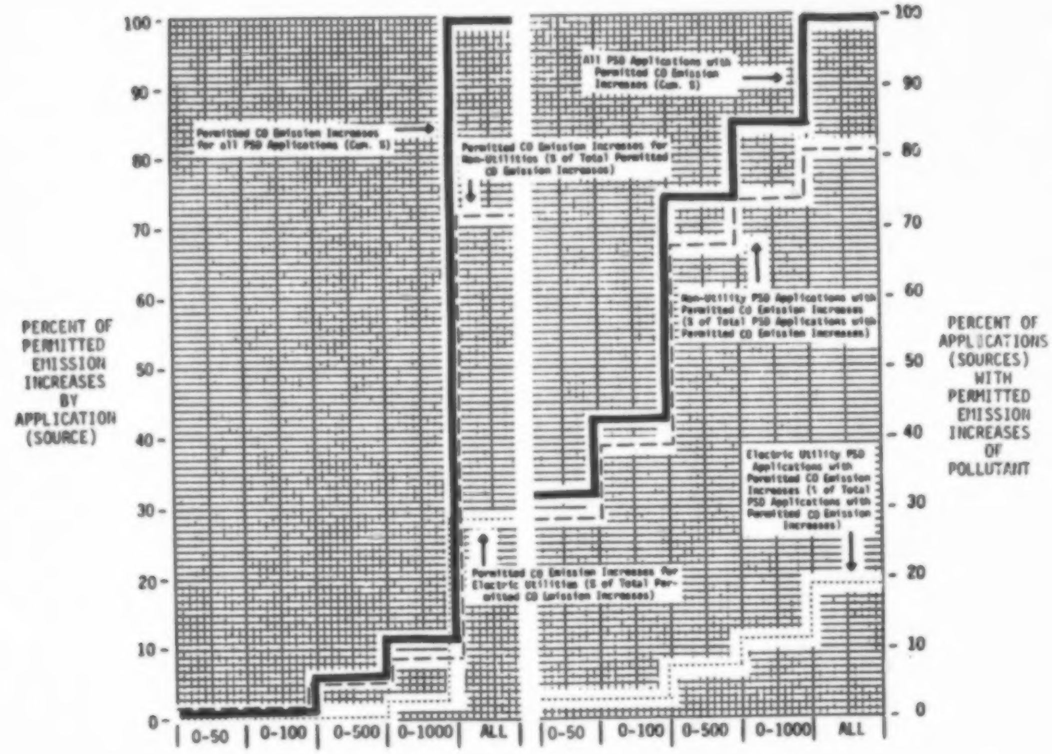
[1] Sum of NO_x net emission increases for all data base applications = 709.0 M tons/year.

[2] Total number of data base applications with permitted net emission increases of NO_x = 211.

*Data base applications with permitted net decreases of NO_x are not included in the construction of this figure.

Figure 4-4. DISTRIBUTION OF PERMITTED EMISSION INCREASES BY APPLICATION (SOURCE) SIZE (INCLUDING NET PSD EMISSIONS AND GROSS LAER EMISSIONS)*

POLLUTANT: CARBON MONOXIDE (CO)



EMISSIONS SIZE CATEGORY (Permitted Net Emission Increases, Tons/Yr Per PSD Application)

Note: Emission unit size categories in Figure are cumulative whereas they are discrete in Table.

Emissions Size Category (Permitted Net Emission Increases, Tons/Yr Per PSD Application)	Permitted Emission Increases (% of Total)			Applications (Sources) with Permitted Emission Increases of Pollutant (% of Total)		
	Utility	Non-utility	Total[1]	Utility	Non-utility	Total[2]
0 - 50	<.1	.6	.6	2.8	30.7	33.5
50 - 100	0	.3	.3	0	10.6	10.6
100 - 500	.8	4.8	5.6	3.9	26.8	30.7
500 - 1000	2.4	3.2	5.6	3.9	5.7	9.6
>1000	25.8	62.1	87.9	7.8	7.8	15.6
TOTAL	29.0	71.0	100	18.4	81.6	100

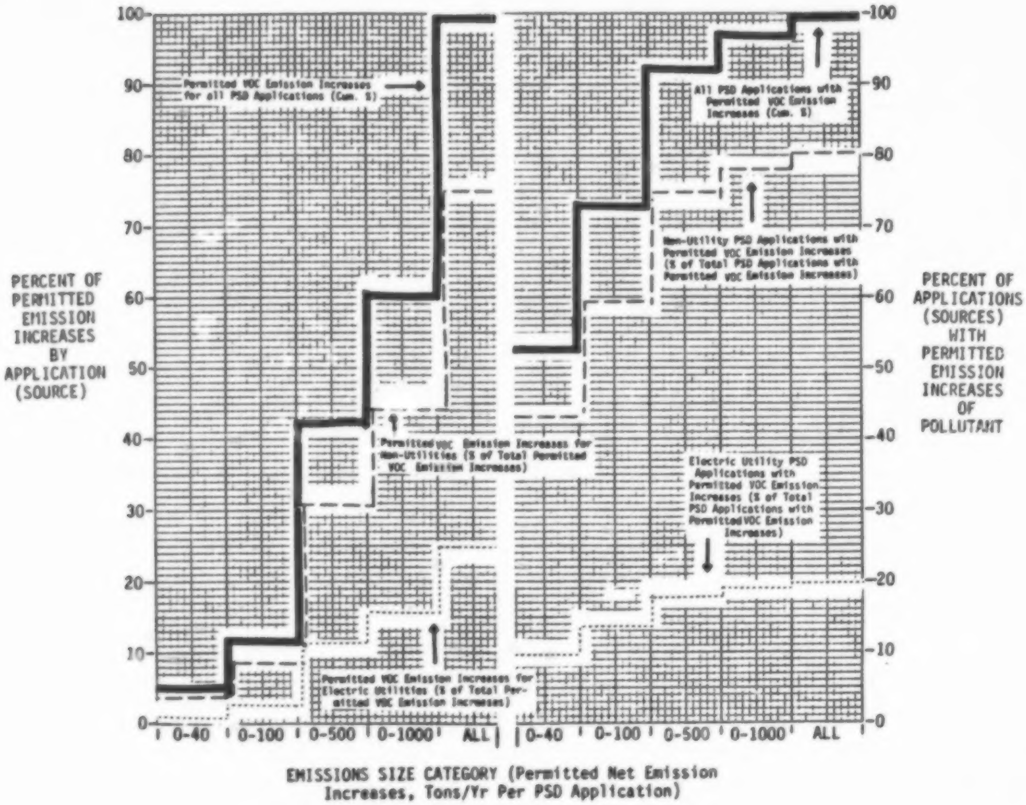
[1] Sum of CO net emission increases for all data base applications = 248.1 M tons/year.

[2] Total number of data base applications with permitted net emission increases of CO = 179.

*Data base applications with permitted net decreases of CO are not included in the construction of this figure.

Figure 4-5. DISTRIBUTION OF PERMITTED EMISSION INCREASES BY APPLICATION (SOURCE) SIZE (INCLUDING NET PSD EMISSIONS AND GROSS LAER EMISSIONS)*

POLLUTANT: VOLATILE ORGANIC COMPOUNDS (VOC)



Note: Emission unit size categories in Figure are cumulative whereas they are discrete in Table.

Emissions Size Category (Permitted Net Emission Increases, Tons/Yr Per PSD Application)	Permitted Emission Increases (% of Total)			Applications (Sources) with Permitted Emission Increases of Pollutant (% of Total)		
	Utility	Non-utility	Total[1]	Utility	Non-utility	Total[2]
0 - 40	1.3	4.0	5.3	9.7	43.1	52.8
40 - 100	1.3	4.5	5.8	3.5	16.6	20.1
100 - 500	8.9	22.2	31.1	4.2	15.2	19.4
500 - 1000	4.4	13.4	17.8	1.4	3.5	4.9
>1000	8.9	31.1	40.0	.7	2.1	2.8
TOTAL	24.8	75.2	100	19.5	80.5	100

[1] Sum of VOC net emission increases for all data base applications = 22.5 M tons/year.

[2] Total number of data base applications with permitted net emission increases of VOC = 144.

*Data base applications with permitted net decreases of VOC are not included in the construction of this figure.

emissions decrease of 15,000 tons per year. Had net decreases been included in these figures, an unrealistic picture of emissions changes would appear. Note that these figures refer to emissions increases as "permitted emissions increases" indicating that these are the values specified in the PSD permits. Those emissions increases subject to nonattainment (LAER) review are considered in Figures 4-1 through 4-5 on a "gross" basis. This represents the emissions level after application of LAER but before emissions "offsets" as required by the nonattainment regulations.

In Figures 4-1 through 4-5, the upper figure presents the percent of all permitted emission increases and associated percent of all applications with permitted emission increases by size category. The values presented are cumulative across size categories. The lower table presents the same information except that the values are discrete within size categories. Also, the sum of the net emission increases for all data base applications emitting the pollutant and the associated number of applications are presented.

To illustrate the use of Figures 4-1 through 4-5, consider the PM emissions in the 0-500 TPY (tons per year) size class in Figure 4-1. The left element of the upper figure shows that PM emissions in this size class (0-500 TPY) are about 24 percent of the total PM emission increases. In this size class, non-utility PM emissions contribute about 20 percent and utility sources contribute about 4 percent. Note that in this size class alone, non-utility PM emissions constitute about 83 percent (20/24ths) and utility emissions about 17 percent (4/24ths) of the emission increases. The 0-500 TPY size category represents about 15,000 tons (24% of 62,000 tons) of emissions increases, of which 12,500 tons is attributable to non-utility applications.

Also, presented in Figure 4-1 are the percent of PSD applications corresponding to the emissions of each size class. The right element of the upper figure shows the percentage of PSD applications in a size class relative to the total number of PSD applications involving PM emission increases. Examination of the upper figure shows that the PSD applications in the 0-500 TPY range are about 86 percent of all PSD applications involving PM emissions increases, of which utility and non-utility sources are about 6 percent and 80 percent, respectively.

As can be seen from Figures 4-1 through 4-3, the effects of utility source emissions are seen in the all category indicating that most utility applications generally have increases of PM, SO_2 and NO_x emissions greater than 1,000 TPY per application. This is not true for CO and VOC emissions as seen in Figures 4-4 and 4-5. Shown below are the relative contributions to total permitted emissions by utility and non-utility sources:

	PM	SO_2	NO_x	CO	VOC
Utility Sources	61%	77%	78%	39%	67%
Non-utility Sources	39%	23%	22%	61%	33%

4.3 POLLUTANT REVIEWS AND EMISSIONS COVERAGE AT VARIOUS THRESHOLDS

Figures 4-6 through 4-10 present the distribution of data base applications with "significant emission increases" of PM, SO_2, NO_x, CO and VOC, respectively. These figures can be used to assess the effects on pollutant reviews and emissions coverage eliminated from PSD review at any applicability threshold between the current "significance" level and 2,500 TPY. These figures represent "pollutant reviews" and not entire PSD applications.

The lower graphs of Figures 4-6 through 4-10 show the number of data base PSD applications with pollutant emissions below any cutoff point in the range of "significant" to 2500 TPY. The 1980 PSD regulations define a "significant" increase for criteria pollutants as the following emission levels:

PM = 25 TPY
SO_2 = 40 TPY
NO_x = 40 TPY
CO = 100 TPY
VOC = 40 TPY

The upper graphs of these figures show the percentage of applicable data base PSD applications below a specified threshold and the corresponding percentage of data base pollutant emissions increases associated with those PSD applications.

Figure 4-6

DISTRIBUTION OF DATA BASE APPLICATIONS WITH SIGNIFICANT PM EMISSION INCREASE AT THRESHOLDS OF 25-2500 TONS/YEAR

(Major Source Threshold for New Major Sources)
(Significant Emission Rate for Major Modifications)

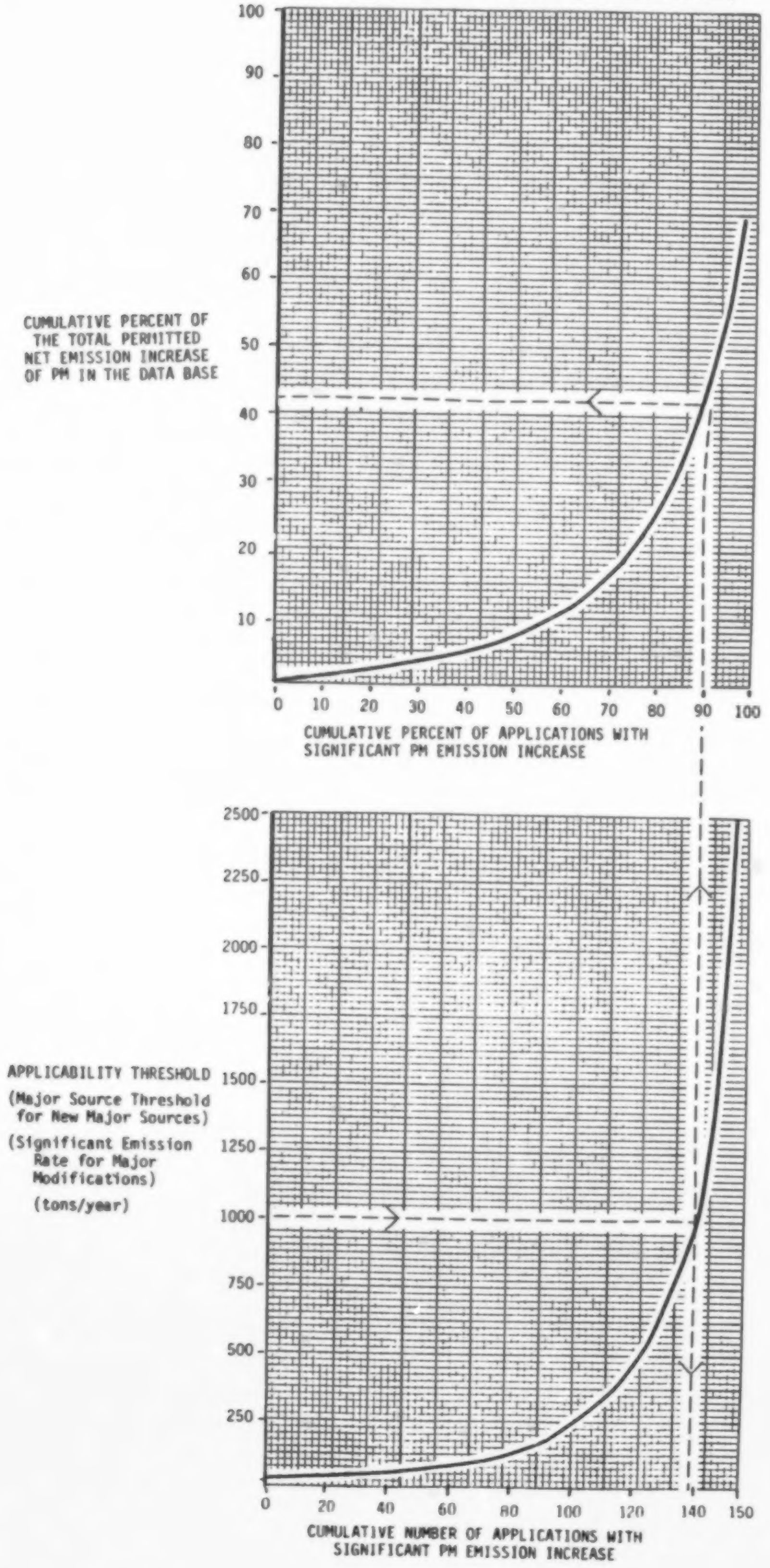


Figure 4-7

DISTRIBUTION OF DATA BASE APPLICATIONS WITH SIGNIFICANT SO_2 EMISSION INCREASE AT THRESHOLDS OF 40-2500 TONS/YEAR

(Major Source Threshold for New Major Sources)
(Significant Emission Rate for Major Modifications)

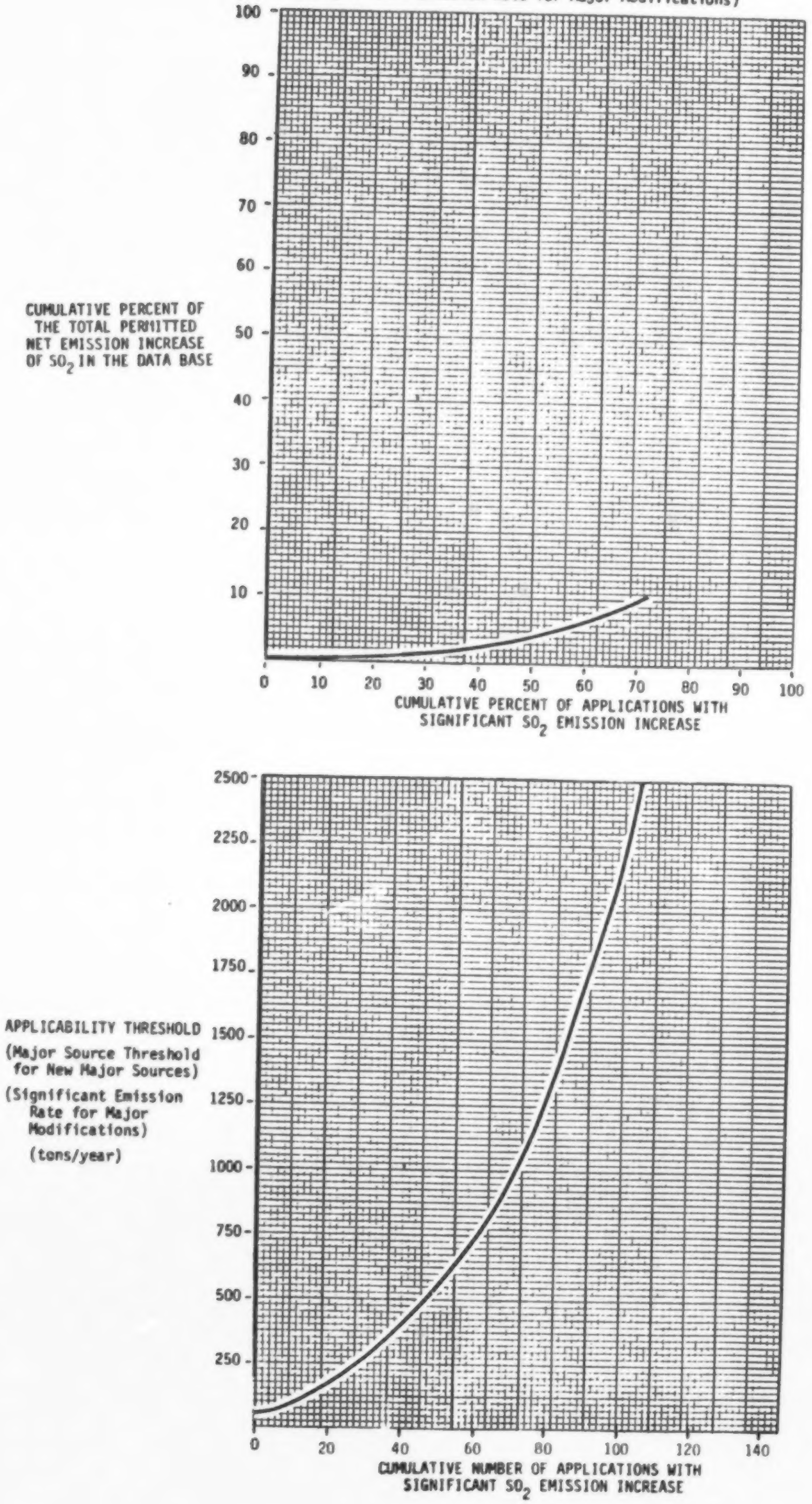


Figure 4-6

DISTRIBUTION OF DATA BASE APPLICATIONS WITH SIGNIFICANT NO_x EMISSION INCREASE AT THRESHOLDS OF 40-2500 TONS/YEAR

(Major Source Threshold for New Major Sources)
(Significant Emission Rate for Major Modifications)

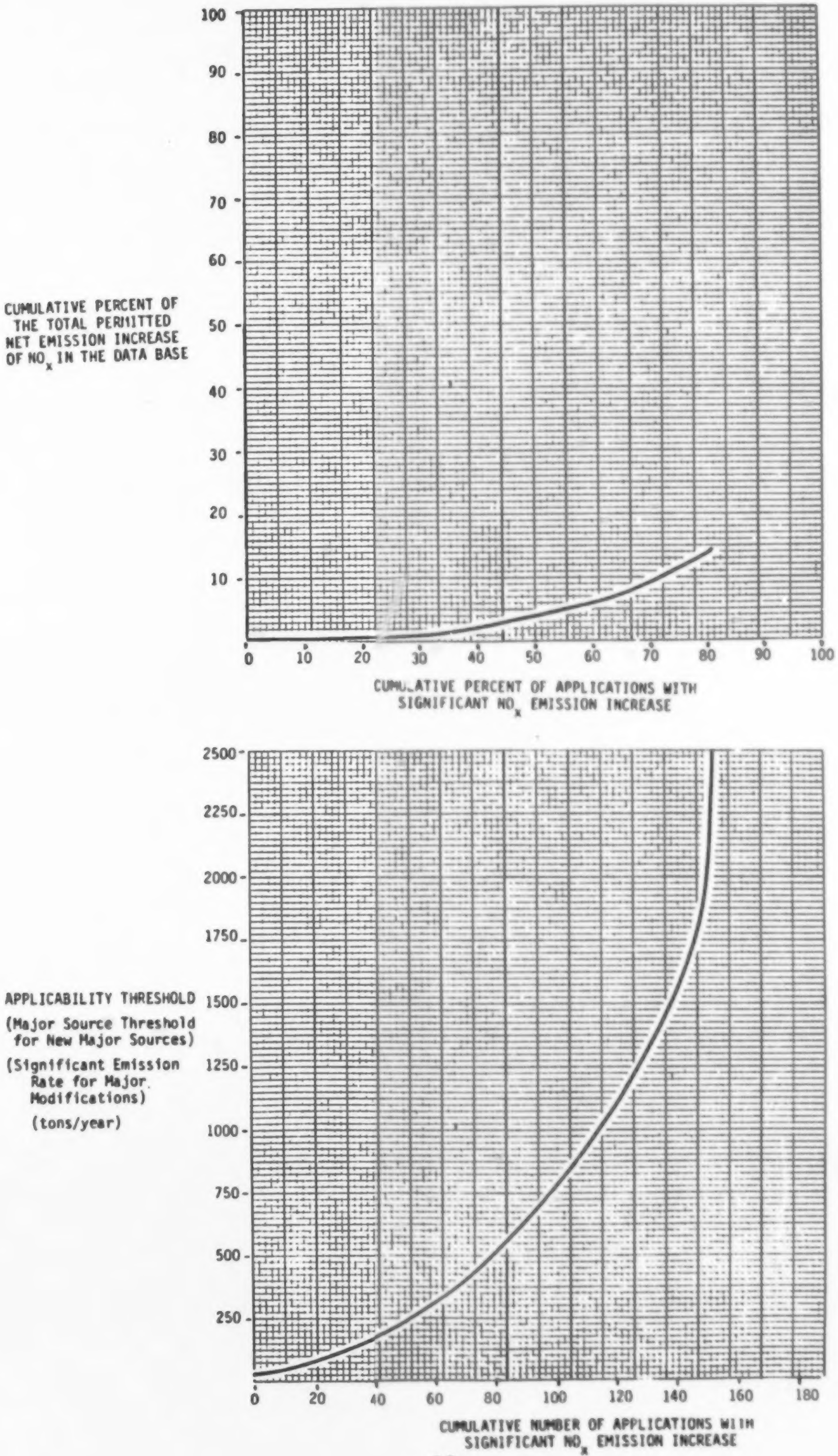
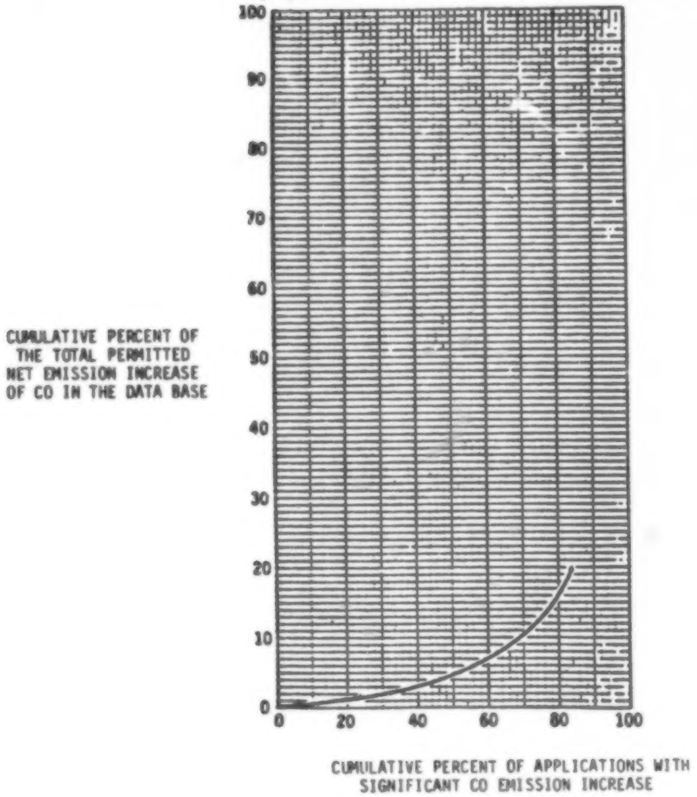


Figure 4-9

DISTRIBUTION OF DATA BASE APPLICATIONS WITH SIGNIFICANT CO EMISSION INCREASE AT THRESHOLDS OF 100-2500 TONS/YEAR

(Major Source Threshold for New Major Sources)
(Significant Emission Rate for Major Modification)



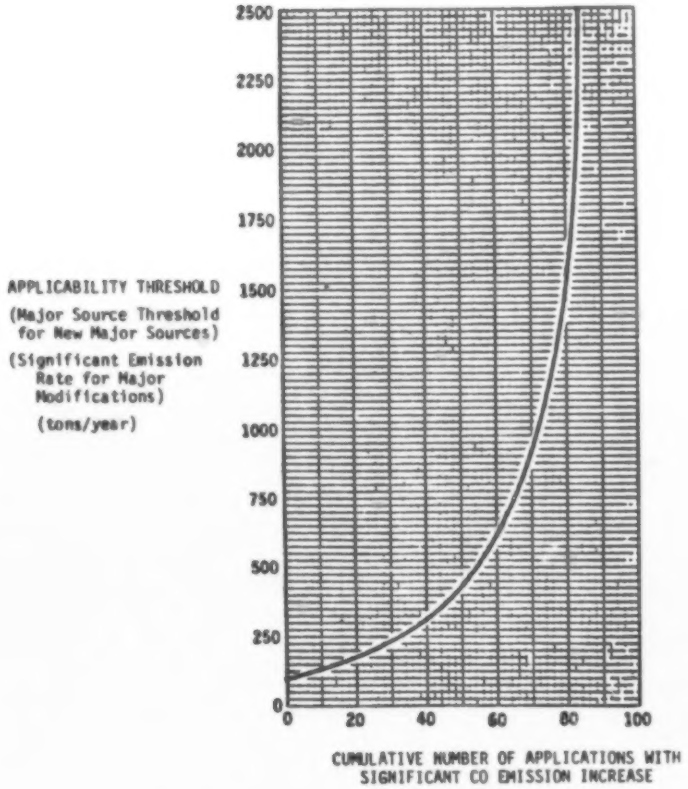
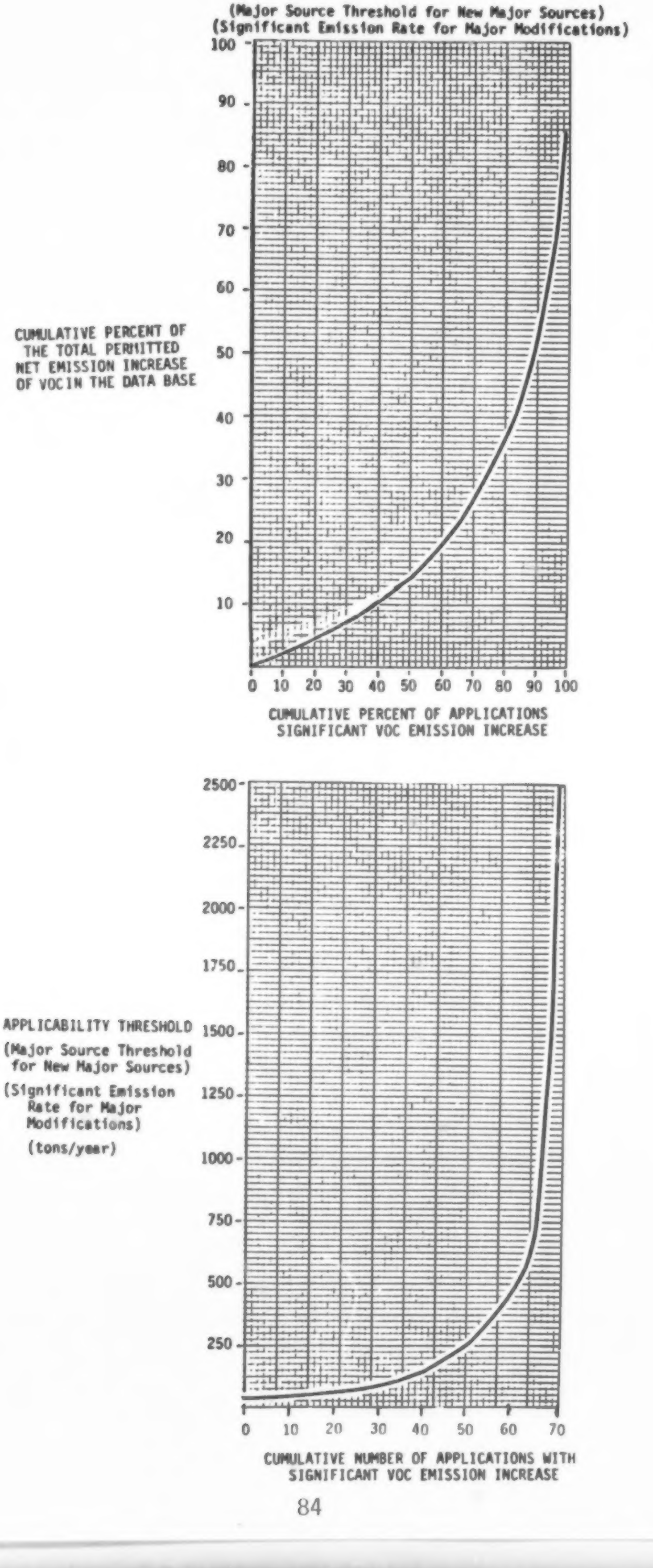


Figure 4-10

DISTRIBUTION OF DATA BASE APPLICATIONS WITH SIGNIFICANT VOC EMISSION INCREASE AT THRESHOLDS OF 40-2500 TONS/YEAR



An example of the use of Figures 4-6 through 4-10 is shown in Figure 4-6. At a threshold of 1,000 TPY of PM emissions increases (on the ordinate scale of the lower figure), approximately 138 data base PSD applications individually have PM emissions increases below 1,000 TPY but above 25 TPY. Moving vertically to the horizontal scale of the upper portion, it is seen that these 138 data base PSD applications represent about 90 percent of those in the data base with "significant" PM emissions increases. Moving vertically to the curve on the upper portion of this figure, then moving horizontally to the vertical scale shows that the PM emissions increases associated with these 90 percent of data base PSD applications represent about 42 percent of the total data base PM emissions increases. Therefore, moving the PM "significant" emission level to 1,000 TPY for applicability purposes will eliminate about 90 percent of PM emissions reviews and about 42 percent of the PM emissions coverage from those captured by the 1980 regulations. The method described above for using Figure 4-1, can be applied to each pollutant individually. Note that this same 1,000 TPY threshold applied to SO_2 emissions in Figure 4-7 eliminates about 47 percent of the SO_2 reviews but only about 3 percent of the SO_2 emissions.

The curves presented in Figures 4-6 through 4-10 have been slightly smoothed and, therefore, only approximate the actual numbers. An attempt was made to be as precise as possible at thresholds of 100, 250, 500, 1,000 and 2,500 TPY. The values extracted from the figures should not be used as "exact" numbers.

4.4 PERMIT APPLICATIONS ELIMINATED FROM REVIEW AT VARIOUS THRESHOLDS

Figures 4-11, 4-12 and 4-13 show the numbers of new major sources, modifications and combinations of the two (all applicable data base applications) that would be eliminated from PSD review at various threshold levels up to 1,000 tons per year. Figure 4-11, elimination of new major sources from PSD review, examines the effect of "new major source" thresholds (tons per year of potential emissions) on new source applications. Figure 4-12, elimination of major modifications from PSD review, examines the effect of "significance" values (tons/year increase in actual emissions) on modification applications. Figure 4-13, data base applications

Figure 4-11. NEW MAJOR SOURCE DATA BASE APPLICATIONS ELIMINATED FROM PSD REVIEW AT VARIOUS APPLICABILITY THRESHOLDS

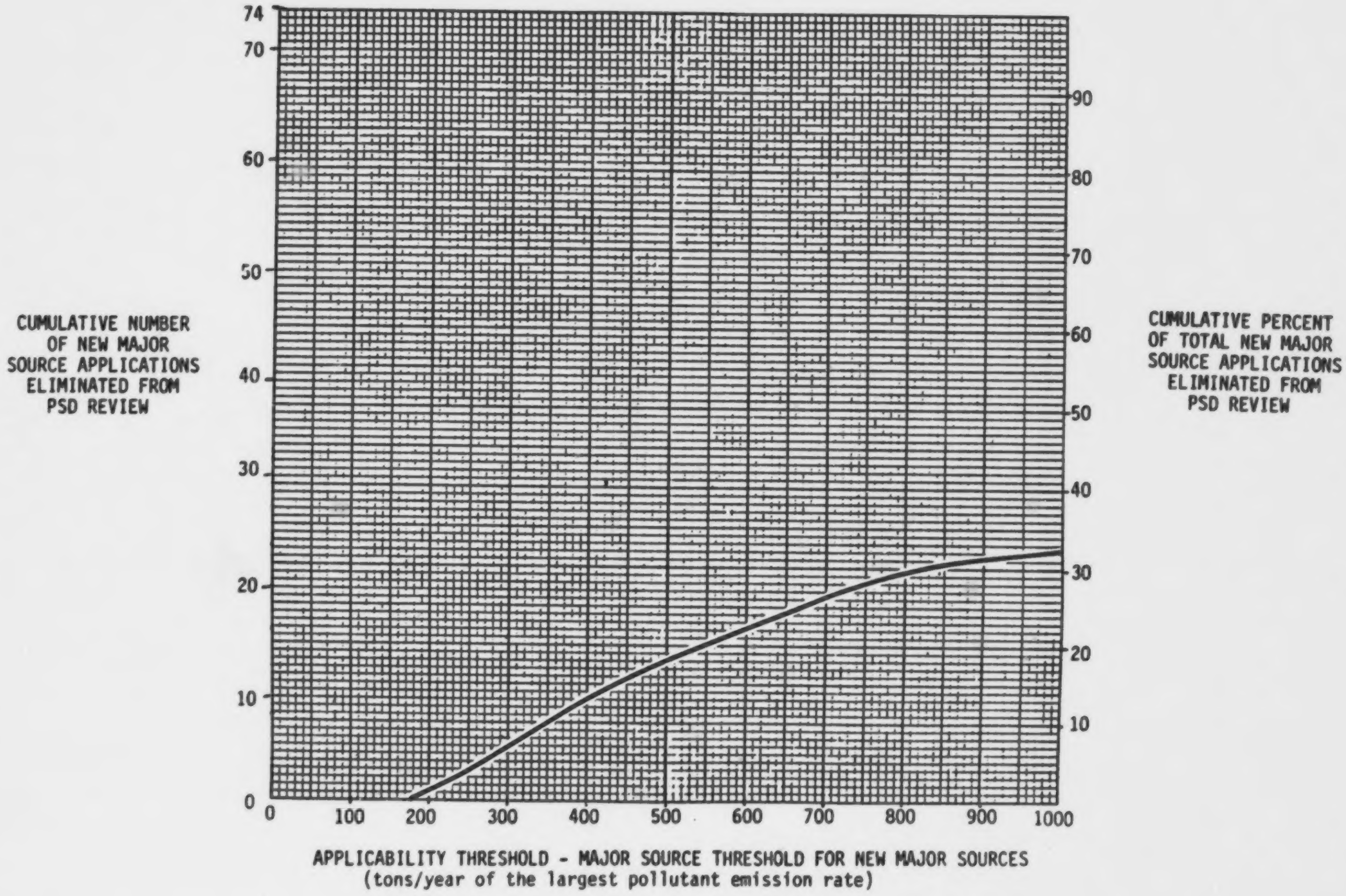


Figure 4-12. MAJOR MODIFICATION DATA BASE APPLICATIONS ELIMINATED FROM PSD REVIEW AT VARIOUS APPLICABILITY THRESHOLDS

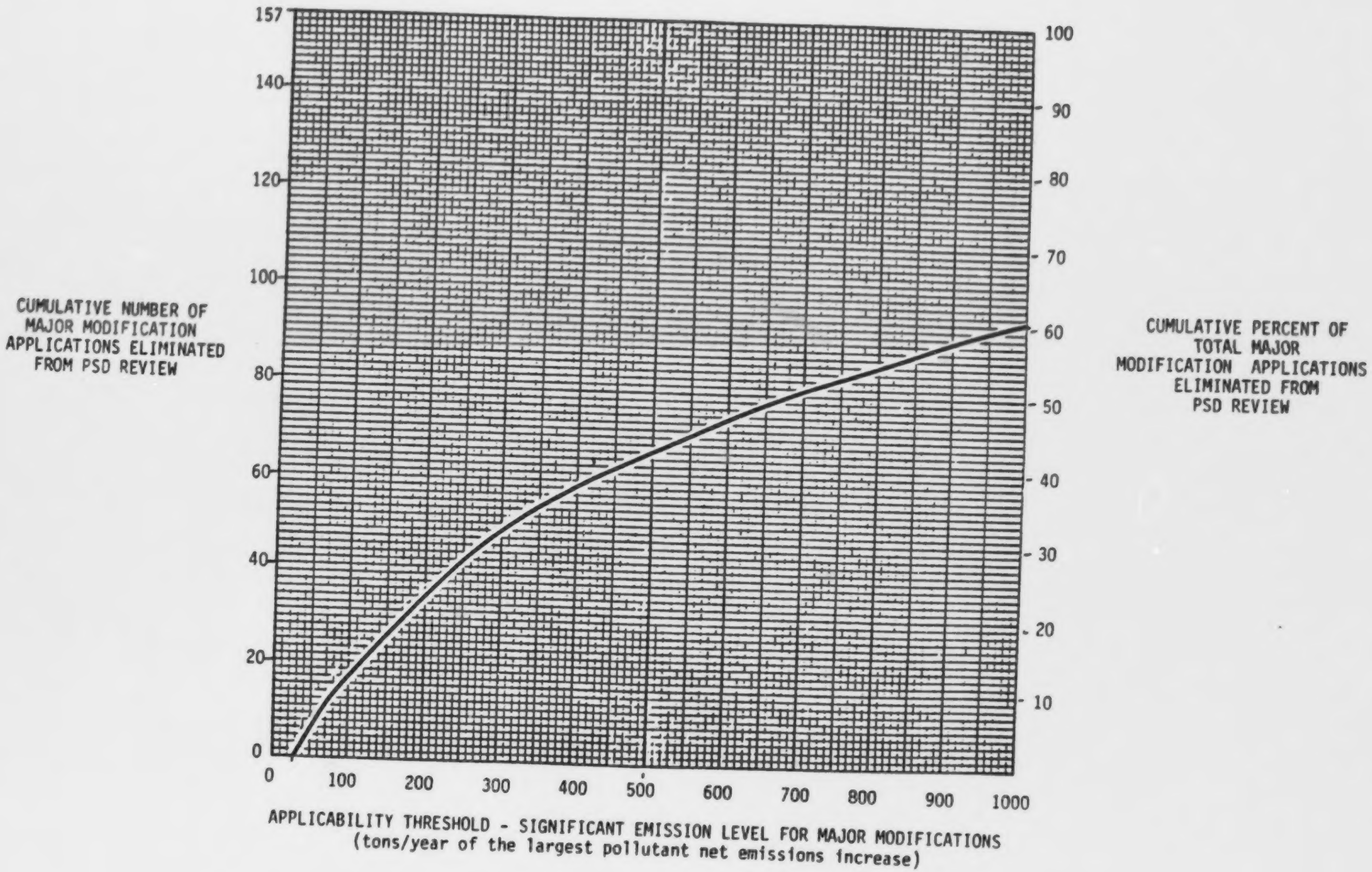
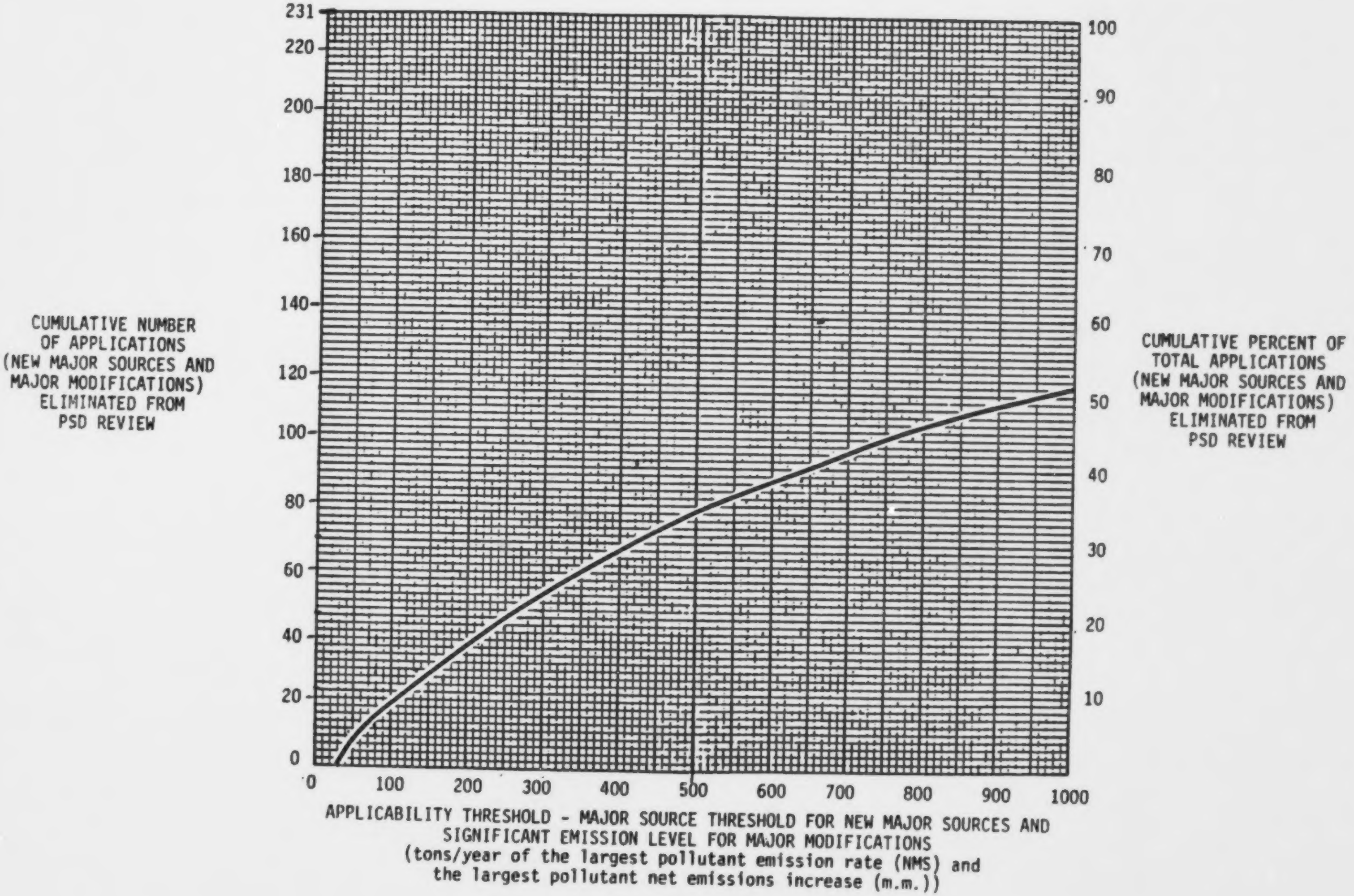


Figure 4-13. ALL DATA BASE APPLICATIONS ELIMINATED FROM PSD REVIEW AT VARIOUS APPLICABILITY THRESHOLDS



eliminated from PSD review, assumes that the applicability thresholds for new sources and modifications are the same.

Examination of Figure 4-11 shows that a 500 TPY new major source threshold will eliminate approximately 18 percent of the new major sources in the data base. Figure 4-12 shows that the same 500 TPY "significant emission rate" threshold would eliminate approximately 42 percent of the major modifications in the data base. Figure 4-13 shows that a 500 TPY applicability level applied to both new major sources and major modifications will eliminate approximately 34 percent of all (both major modification and new major source) applications in the data base. The curves in Figures 4-11 through 4-13 have been smoothed and, therefore, numbers extracted from the figures only approximate the actual values.

Table 4-1 presents the percentage of applications eliminated from PSD review at 100, 500 and 1,000 TPY. Also shown in this table are the relative amounts of pollutant reviews and emissions coverage eliminated from review. (A detailed description of pollutant reviews and emissions coverages eliminated from PSD review is presented in Section 4.3.)

Examination of Table 4-1 shows that a uniform emissions threshold of 100 tons per year, 7% of the applications that would otherwise be subject to PSD review would be exempt. At this level, 45% of the PM reviews would be eliminated. This means that the PM emission increases subject to review in 45% of the data base applications were less than 100 tons per year. The PM emissions increase associated with these applications is 6% of the total data base PM emissions. Similarly, at a uniform 100 TPY "significance" threshold, 8% and 7% of the SO_2 and NO_x reviews, respectively, would be exempt. The SO_2 and NO_x emissions increases associated with these reviews are each less than 1% of the total SO_2 and NO_x emissions in the data base.

4.5 ELIMINATION OF NON-CRITERIA POLLUTANTS FROM PSD REVIEW

Table 4-2 presents the distribution of all data base applications with emissions of non-criteria pollutants. Examination of the table reveals that more data base applications are permitted to emit fluorides than any other non-criteria pollutant. Source types with permitted net increase of fluorides include aluminum smelters and chemical plants.

Table 4-1. THE NUMBER OF CRITERIA POLLUTANT REVIEWS AND AMOUNT OF ASSOCIATED EMISSIONS ELIMINATED AT SELECTED UNIFORM APPLICABILITY THRESHOLDS

Emissions Threshold (TPY)	Pollutant	% of Pollutant Reviews Eliminated	% of Emissions Eliminated	% of PSD Applications Eliminated
100	PM	45	6	7
	SO_2	8	<1	
	NO_x	7	<1	
	CO	NA	NA	
	VOC	43	8	
500	PM	80	25	33
	SO_2	34	2	
	NO_x	40	2	
	CO	55	6	
	VOC	84	40	
1000	PM	91	44	51
	SO_2	47	3	
	NO_x	61	6	
	CO	72	11	
	VOC	94	60	

Table 4-2. DISTRIBUTION OF APPLICATIONS WITH NET EMISSIONS INCREASES OF NON-CRITERIA POLLUTANTS AT SELECTED THRESHOLDS[a]

Applicability threshold (tons/year)	Number of applications with a permitted net emission increase of pollutant (total amount of permitted net emissions, tons/year)					
	Fluorides	Lead	Vinyl chloride	Sulfuric acid mist	Total reduced sulfur	Hydrogen sulfide
0-significant level	--	3 (.6)	--	1 (4)	--	--
significant level-10	2 (7)	--	--	--	N/A	N/A
10-25	4 (86)	--	1 (18)	--	--	--
25-50	1 (36)	--	--	--	3 (98)	--
50-100	3 (239)	--	1 (62)	1 (54)	--	--
100-All	2 (668)	--	--	2 (362)	1 (1,096)	2 (700)
TOTAL	12 (1,036)	3 (.6)	2 (80)	4 (420)	4 (1,194)	2 (700)

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[a] No emissions of asbestos, beryllium or mercury are in the data base.

[b] Significant levels as defined in the 1980 PSD regulations: Fluorides = 3 TPY; Lead = 6 TPY; Vinyl chloride = 1 TPY; Sulfuric acid mist = 7 TPY; Total reduced sulfur = 10 TPY; Hydrogen sulfide = 10 TPY.

5.0 ANALYSIS OF BACT AND LAER ASSOCIATED WITH FINAL PERMIT EMISSIONS LIMITATIONS

5.1 INTRODUCTION

Most emissions limitations in PSD permits are a result of case-by-case application of either Best Available Control Technology (BACT) for "attainment" pollutants or Lowest Achievable Emission Rate (LAER) for "nonattainment" pollutants. The primary intent of this section is to quantify the effects of case-by-case BACT or LAER and determine, where possible, the driving force of BACT and LAER limits more stringent than applicable New Source Performance Standards. The assumptions and methods used to produce the results of this section are presented in Appendix E.

The analyses presented in this section focus only on emission units subject to either BACT (BACT-permitted) or applicable LAER (LAER-permitted) provisions. They do not include emission reductions resulting from equipment shutdowns and similar situations; nor do they include permit limitations that were specified solely for administrative purposes.

5.2 TECHNOLOGY REVIEWS

Table 5-1 shows, by pollutant, the number of data base applications and emission units that were subject to BACT or LAER review. In most cases, BACT technology reviews were required for more than one pollutant per PSD application. Therefore, in Table 5-1, the sum of the number of sources subject to a BACT analysis by pollutant is greater than the number of data base PSD applications.

Examination of Table 5-1 shows that 2,350 BACT technology reviews were performed, 34 of which were for non-criteria pollutants. A total of 102 LAER technology reviews were performed. Non-criteria pollutants are not subject to LAER review because nonattainment provisions never apply to these pollutants. Nitrogen oxides emissions are shown to be most frequently subject to BACT. VOC emissions are shown to be most frequently subject to LAER. Only five of the nine non-criteria pollutants were subject to BACT. No BACT technology reviews were performed on asbestos, beryllium, mercury or reduced sulfur compounds.

Table 5-1. **DATA BASE BACT AND LAER APPLICABILITY BY SOURCE AND EMISSION UNITS**

Pollutant	Number of Applications (Sources) Subject to BACT*	Number of Applications (Sources) Subject to LAER*	Number of Emission Units Subject to BACT	Number of Emission Units Subject to LAER
Particulate Matter (PM)	163	15	589	35
Sulfur Dioxide (SO_2)	157	6	429	9
Nitrogen Oxides (NO_x)	186	3	727	6
Carbon Monoxide (CO)	95	6	427	12
Volatile Organic Compounds (VOC)	43	26	144	40
Fluorides (F)	9	-	18	-
Vinyl Chlorides	1	-	4	-
Total Reduced Sulfur (TRS)	3	-	6	-
Hydrogen Sulfide (H_2S)	2	-	2	-
Sulfuric Acid Mist	3	-	4	-
Total Technology Reviews			2350	102

*Most applications (sources) were subject to either BACT and/or LAER for more than one pollutant. Therefore, the sum of these columns is greater than the number of data base sources.

Sources of fugitive emissions that were subject to BACT are included in Table 5-1. However, fugitive emissions generally emanate from many locations at a source (such as valves and flanges at refineries, conveyor belts for materials handling, etc.). In these cases, all similar fugitive emission points at a source were consolidated and were considered to be one emission unit.

5.3 EFFECTS OF NSPS AND NESHAPS ON BACT AND LAER

Emission Units

Presented in Table 5-2 are the number of data base emission units subject to NSPS which were permitted for BACT at the NSPS (or NESHAPS) allowable emission rate and below the NSPS (or NESHAPS) allowable emission rate. The data are divided into data base utility applications and all data base applications (including utilities). Many of the emission units identified were subject to NSPS for more than one pollutant. For example, each utility boiler subject to Subpart Da must meet emission requirements for three pollutants; PM, SO_2, and NO_x. Because it is difficult in many cases to determine whether VOC emission units are permitted at or below NSPS levels, they are omitted from Table 5-2.*

As can be determined from Table 5-2, 27 percent of all data base BACT reviews subject to a NSPS (or NESHAPS) were permitted at less than the NSPS (or NESHAPS) allowable emission rate. This value is 36% for utility applications. On a criteria pollutant basis for all applications, this value ranged from 15% for NO_x emissions to 32% for SO_2 emissions. For utilities, this value ranged from 30% for NO_x emissions to 43% for SO_2 emissions. CO emissions from utilities are not subject to a NSPS.

The last row of Table 5-2 shows, for emission units permitted more stringent than the applicable NSPS, the ratio of the BACT-permitted emission rates to the maximum emission rates allowed by the applicable NSPS (or NESHAPS). For instance, for the 51 emission units permitted below the NSPS rate, BACT-permitted SO_2 emissions averaged 45% of the SO_2 emissions that would be allowed by the applicable NSPS.

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*NSPS for many VOC sources specify equipment standards that can be met with various alternatives, some of which are work practice or equipment type standards.

Table 5-2. TECHNOLOGY REVIEWS SUBJECT TO NSPS (OR NESHAP) PERMITTED FOR BACT AT NSPS (OR NESHAP) RATE AND BELOW NSPS (OR NESHAP) RATE*

	NSPS (or NESHAP) Pollutant												
	Particulate Matter (PM)		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Carbon Monoxide (CO)		Hydrogen Sulfide (H_2S)	Fluorides (F)	Reduced Sulfur (TRS)	Vinyl Chloride	H_2SO_4 Mist
	Total	Utilities only	Total	Utilities only	Total	Utilities only	Total	Utilities only	Total	Total	Total	Total	Total
Number of emission units permitted for BACT at NSPS (or NESHAP) rate	75	31	107	35	135	45	7	0	1	14	3	4	2
Number of emission units permitted for BACT below NSPS (or NESHAP) rate	34	15	51	26	24	20	2	0	0	4	1	0	1
% NSPS (or NESHAP) units subject to BACT permitted below NSPS (or NESHAP) rate	31%	32%	32%	43%	15%	30%	22%	–	0%	22%	25%	0%	33%
Ratio of BACT to NSPS Allowable Emission Rate for Emission Units Permitted Below NSPS Rate	.49	.50	.45	.44	.79	.79	.52	–	–	.44	.84	–	.67

*An emission unit subject to NSPS for 2 pollutants is considered to undergo 2 technology reviews.

Note: Most VOC NSPS (or NESHAP) are work practice or equipment standards - unable to quantify emissions.

Allowable Emissions

Table 5-3 presents the distribution of BACT-permitted emissions by utility, non-utility and all (utility and non-utility) data base applications. The data include BACT-permitted emissions subject to NSPS (or NESHAPS) and emission reductions beyond NSPS (or NESHAPS). Emission reductions result from permitted emission limitations more stringent than the applicable NSPS (or NESHAPS). For instance, as shown in Table 5-3, there were 218,700 tons/yr of SO_2 emission reductions beyond NSPS permitted in the data base.

Those BACT-permitted emissions for utility sources not subject to a NSPS generally consisted of small standby boilers, small turbines, internal combustion engines or fugitive emission units.

The majority of BACT-permitted PM and SO_2 emission reductions beyond NSPS for non-utility sources occurred at aluminum smelters, petroleum refineries, kraft pulp and paper plants and glass manufacturing plants. The non-utility permitted NO_x emission reductions beyond a NSPS occurred mostly at petroleum refineries and aluminum smelters. The BACT-permitted CO emission reductions beyond NSPS are from fluid catalytic cracking units (FCCU's) located at two petroleum refineries. The BACT-permitted fluoride emission reductions beyond NSPS occurred at two aluminum smelters.

Consolidating the data for all pollutants in Table 5-3, the distribution of emissions by utility and non-utility sources is shown below:

	BACT-permitted emissions (TPY)			Emissions reductions beyond NSPS (TPY)	"Hypothetical" NSPS emissions (TPY)	"Hypothetical" BACT-permitted emissions (TPY)
	Total data base	Subject to NSPS Total	Subject to NSPS % of total			
Utility sources	1,220,000	1,130,000	93%	270,000	1,400,000	1,490,000
Non-utility sources	487,000	121,000	25%	14,500	135,500	501,500
Total	1,707,000	1,250,000	73%	284,500	1,535,500	1,991,500

The "hypothetical" columns of the above table indicate the approximate emission rate if all NSPS emission units had been permitted at the NSPS allowable level. As shown above, 93% of BACT-permitted utility emissions are subject to NSPS, whereas 25% of non-utility emissions are subject to NSPS.

Table 5-3. TOTAL BACT-PERMITTED POLLUTANT EMISSIONS, EMISSIONS SUBJECT TO NSPS (OR NESHAPS) AND EMISSIONS REDUCTIONS BEYOND NSPS (OR NESHAPS) BY UTILITY POWER PLANT SOURCES AND NON-UTILITY SOURCES

	PSD Pollutant																				
	Particulate Matter (PM)		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Carbon Monoxide (CO)		Volatile Organic Compounds (VOC)*	Hydrogen Sulfide (H_2S)		Fluorides (F)		Total Reduced Sulfur (TRS)		Vinyl Chloride		H_2SO_4 Mist			
	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NESHAPS	Total	Subject to NSPS		
BACT permitted emissions for non-utility sources - tons/yr	22,800	7,400	192,400	41,500	162,500	63,700	97,600	7,500	9,200	700	580	300	300	1,160	60	110	110	180	120		
BACT permitted emissions for utility sources - tons/yr	31,400	27,800	569,400	561,900	549,900	542,600	61,500	0	4,500	0	0	510	0	0	0	0	0	0	0		
Total BACT permitted emissions - tons/yr	54,200	35,200	761,800	603,400	712,400	606,300	159,100	7,500	13,700	700	580	810	300	1,160	60	110	110	180	120		
BACT permitted emissions reductions beyond NSPS by non-utility sources - tons/yr	-	1,600	-	8,500	-	1,200	-	2,970	-	-	0	-	240	-	1	-	0	-	2		
BACT permitted emissions reductions beyond NSPS by utility sources - tons/yr	-	6,100	-	210,200	-	53,200	-	0	-	-	0	-	0	-	0	-	0	-	0		
Total BACT permitted emission reductions beyond NSPS - tons/yr	-	7,700	-	218,700	-	54,400	-	2,970	-	-	-	240	-	1	-	0	-	2			

*VOC NSPS's are generally work practice or equipment standards. Unable to quantify VOC emissions subject to NSPS.

By pollutant, the BACT-permitted emission rates for all emission units subject to NSPS expressed as a percentage of the "hypothetical" NSPS allowable emissions are as follows:

	PM	SO_2	NO_x	CO	Fluorides
Non-utility sources	82%	83%	98%	72%	56%
Utility sources	82%	73%	91%	N/A	N/A
All sources	82%	73%	92%	72%	56%

Rearranging the data in Table 5-4, the BACT-permitted emission reductions beyond NSPS expressed as a percentage of all data base BACT-permitted emissions are as follows:

	PM	SO_2	NO_x	CO	Fluorides
Non-utility sources	7%	4%	1%	3%	80%
Utility sources	20%	37%	10%	N/A	N/A
All sources	14%	29%	8%	2%	30%

As shown in the above tables, SO_2 control at utility sources and fluoride control at non-utility sources (predominately aluminum smelters) reduced emissions well below the applicable NSPS. As can be seen from the above tables, most of the emissions reductions beyond NSPS occurred at utility sources. However, as mentioned previously, a greater fraction of utility sources' allowable emissions are subject to NSPS than are those for non-utility sources (93% vs. 25%). Shown below is the relationship between permitted emissions subject to NSPS and emission reductions beyond NSPS for PM, SO_2, NO_x, and CO emissions broken down by utility and non-utility sources:

	Relative Contribution to Emission Reductions Beyond NSPS		Relative Contribution to BACT-Permitted Emissions Subject to NSPS	
Pollutant	Utility Sources	Non-utility Sources	Utility Sources	Non-utility Sources
PM	79%	21%	79%	21%
SO_2	96%	4%	93%	7%
NO_x	98%	2%	90%	10%
CO	0%	100%	0%	100%

It appears that the distribution of emission reductions beyond NSPS is fairly consistent with the distribution of BACT-permitted emissions subject to NSPS for utility and non-utility sources.

Table 5-4 is similar to Table 5-3 except that LAER-permitted emissions are presented. Based on the relatively small amount of data, it is difficult to assess the effectiveness of LAER technology review requirements relative to a NSPS baseline.

5.4 BACT VS. LAER

Of the 285 PSD applications, 35 were subject to nonattainment review for certain pollutants. The data were extracted from EPA files which, in most cases, do not contain LAER technology data since LAER reviews are generally performed by State agencies. Therefore, sufficient LAER control technology data are available for only 15 of the 35 PSD applications to compare with BACT data. The 15 applications include 26 emissions units subject to LAER technology review for one or more pollutants. The total number of LAER technology reviews in these applications, determined by counting the number of nonattainment pollutant reviews for each emission unit, is 54.

Table 5-5 shows that the technology applied in the large majority of LAER reviews (48 of 54 reviews) are the same technologies as those applied as BACT (e.g., baghouse or ESP for boilers). No control technology data are available for three of the 54 reviews.

In the remaining three cases, LAER technology is unlike typical BACT technology. For one of these cases, miscellaneous vents from a tire sealant process, no similar emission unit subject to BACT could be found (see Table 5-5, item 7 - Firestone Tire). The other two cases involve a new type of scrubber for PM control on a large industrial boiler (item 14 - Weyerhauser) and a venturi scrubber for SO_2 control on a reduced crude conversion system (item 9 - Ashland Petroleum). In neither of these cases is the applied control technology characteristic of BACT technologies applied to similar source types.

Nine LAER technology reviews were for emissions units and pollutants subject to New Source Performance Standards (NSPS). For sources subject to LAER and NSPS requirements, Table 5-5 lists applicable NSPS limits for comparison with the permitted LAER limits. Seven LAER technology reviews

Table 5-4. TOTAL LAER-PERMITTED POLLUTANT EMISSIONS, EMISSIONS SUBJECT TO NSPS AND EMISSION REDUCTIONS BEYOND NSPS BY UTILITY POWER PLANT SOURCES AND NON-UTILITY SOURCES

	Non-Attainment Pollutant								
	Particulate Matter (PM)		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Carbon Monoxide (CO)		Volatile Organic Compounds (VOC)*
	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total
LAER permitted emissions for non-utility sources - tons/yr	1,300	900	8,800	3,600	400	100	100	0	1,800
LAER permitted emissions for utility sources - tons/yr	1,100	200	6,100	0	0	0	2,600	0	200
Total LAER permitted emissions - tons/yr	2,400	1,100	14,900	3,600	400	100	2,700	0	2,000
LAER permitted emissions reductions beyond NSPS by non-utility sources - tons/yr	–	1,600	–	0	–	0	–	0	–
LAER permitted emissions reductions beyond NSPS by utility sources - tons/yr	–	0	–	0	–	0	–	0	–
Total LAER permitted emission reductions beyond NSPS - tons/yr	–	1,600	–	0	–	0	–	0	–

*VOC NSPS's are generally work practice or equipment standards. Unable to quantify VOC emissions subject to NSPS.

Table 5-5. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a]

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
1. PPG Industry 79 WV 06	4	Boiler - 243 MMBtu/hr 1.7% S, 14.3% ash bituminous coal	PM	Baghouse	0.042 lb/MMBtu	None	Yes	0.016 to >0.1 lb/MMBtu[c]
2. General Motors Corp. EPA-5-A-80-12	5	Boiler - 150 MMBtu/hr 0.7% S fuel oil	SO_2	Low Sulfur Fuel	1.0 lb/MMBtu	None	Yes	0.5 to 1.2 lb/MMBtu[d]
3. General Motors Corp. EPA-5-A-80-6	5	2 - boilers, 156 MMBtu/hr each, 0.87% S, 10% ash coal	PM	Baghouse	0.06 lb/MMBtu	None	Yes	0.016 to >0.1 lb/MMBtu[c]
		Coal storage pile fugitives	PM	Surfactant Spray Suppression	None	None	Yes	N/A
4. Muscatine Power and Water	7	Electric steam generator - 1546 MMBtu/hr (166MW), 3.1% S, 8.7% ash coal	PM	Baghouse	0.03 lb/MMBtu (203 TPY)	0.03 lb/MMBtu (203 TPY)	Yes	.015 to .03 lb/MMBtu[e]
5. Tennessee Eastman TN-065	4	2 - boilers, 780 MMBtu/hr each, low sulfur coal	PM	ESP	0.018 lb/MMBtu (123 TPY)	0.1 lb/MMBtu (683 TPY)	Yes	0.016 to 0.1 lb/MMBtu[e]
		Coal pile fugitives	PM	Chemical Surfactants	None	None	Yes	N/A

Table 5-5. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a]
(continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
6. Gilman Paper GA-071	4	Coal/wood/oil boiler - 587 MMBtu/hr on coal (1.5% S; 12% ash) and 941 MMBtu/hr on wood (<0.1% S); fuel oil sulfur content is about three percent	PM	ESP	0.07 lb/MMBtu (227 TPY)	0.1 lb/MMBtu (324 TPY)	Yes	.016 to 0.1 lb/MMBtu[e]
			SO_2	Caustic Scrubber	Wood/Coal - 1.2 lb/MMBtu (2143 TPY) Wood/Oil - 0.8 lb/MMBtu	1.2 lb/MMBtu (2143 TPY) 0.8 lb/MMBtu	Yes	.33 to 1.2[e] lb/MMBtu
7. Firestone Tire Co. GA-068	4	Tire sealant lines (2), capacity is confidential.	VOC	Carbon Adsorption Minimum 90% Efficiency	7.4 lb/hr	None	No	Unable to find BACT comparison. Incineration is typical VOC BACT.
		Fugitives from warehouse ventilation	VOC	No Control	58 lb/hr	None	Yes	N/A
8. Firestone Tire Co. GA-067	4	Boiler - 96.4 MMBtu/hr; 1% S oil or gas fired	CO	Combustion Controls	0.08 lb/MMBtu	None	Yes	0.03 to 0.41 lb/MMBtu[d]
9. Ashland Petroleum KY-155	4	Reduced crude conversion system 55,000 BBL/day	PM	Venturi Scrubber	0.45 lb/1000 lb coke burnoff (299 TPY)	1.0 lb/1000 lb coke burnoff (644 TPY)	Yes	0.5 to 1.0 lb/ 1000 lb coke burnoff
			SO_2	Venturi Scrubber	437 lb/MBBL Feed	None	No	500 to 1100 lb/MBBL Feed
			VOC	Waste CO Boiler Incineration	8 PPMV	None	Yes	Unable to find BACT comparison. CO boiler is typical.

Table 5-5. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
		Fugitive VOC from equipment leaks	VOC	Leak Detection and Repair	None	None	Yes	N/A
10. Nevada Power Company NV-80-01	9	No. 8 gas turbine generator - 73.5 Megawatts output, ≈800 MMBtu/hr heat input; 0.25% S, low ash fuel oil fired	PM	Low Ash Fuel	≈0.03 lb/MMBtu	None	Yes	0.04 to 0.11 lb/MMBtu
			CO	No Control	≈0.13 lb/MMBtu	None	Yes	0.12 to 0.68 lb/MMBtu
			VOC	No Control	≈0.006 lb/MMBtu	None	Yes	0.02 to 0.11 lb/MMBtu
11. Nevada Power Company NV-78-02	9	No. 7 gas turbine generator - 73.5 Megawatts output ≈800 MMBtu/hr heat input; 0.25% S, low ash fuel oil or natural gas fired	PM	Low Ash Fuel	≈0.03 lb/MMBtu	None	Yes	0.04 to 0.11 lb/MMBtu
			CO	No Control	≈0.13 lb/MMBtu	None	Yes	0.12 to 0.68 lb/MMBtu
			VOC	No Control	≈0.006 lb/MMBtu	None	Yes	0.02 to 0.11 lb/MMBtu
12. Borg Warner EPA-5-A-80-4	5	Resin compounding facility - 15 process vents	VOC	Waste Air Burner	9.2 lb/hr	None	Yes	Similar to solvent (VOC) emissions BACT. Unable to quantify comparable BACT limits.

Table 5-5. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
13. City of Columbus EPA-5-A-80-3	5	6 - refuse and coal fired electric steam generators; 246 MMBtu/hr ea; coal is 0.9% S, and 10% ash	PM	ESP	0.1 lb/MMBtu	None	Yes	0.033 to >0.1 lb/MMBtu
			SO_2	Low Sulfur Fuel	0.95 lb/MMBtu	None	Yes	0.63 to >1.2 lb/MMBtu
			CO	Combustion Controls	0.26 lb/MMBtu	None	Yes	0.25 to 5.1 lb/MMBtu
			VOC	Combustion Controls	0.016 lb/MMBtu	None	Yes	0.043 to 0.25 lb/MMBtu
14. Weyerhauser Longview PSD-X-81-02	10	Boiler - 1240 MMBtu/hr; coal 0.8% S; 18.7% ash	PM	Electro-Scrubber	0.03 lb/MMBtu (163 TPY)	0.1 lb/MMBtu (543 TPY)	No	0.016 to 0.1 lb/MMBtu
15. Publishers Paper PSD-X-80-03	8	Boiler - 552.5 MMBtu/hr; hog fuel (wood and bark)	VOC	Combustion Controls	0.26 lb/MMBtu	None	Yes	0.25 to 4.4 lb/MMBtu
16. Modesto Irregation District NSR-4-4-8 SJ 79-16	9	Gas turbine 1693 MMBtu/hr; 0.3% S fuel oil	NO_x	Unknown	75 ppmv	75 ppmv	Unknown	75-150 ppmv

Table 5-5. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
17. Refuse Fuels Incorporated	1	Refuse incinerator; 960 tons/day	PM	Unknown	0.03 gr/dscf (96 TPY)	0.08 gr/dscf (257 TPY)	Unknown	0.02 to 0.08 gr/dscf
			VOC	Unknown	7.99 lb/hr	None	Unknown	Unknown

[a] The data base contains 285 applications of which 35 required concurrent PSD and non-attainment review. LAER technology data is available for only 15 of the 35 applications (table entries 1-15). Seven applications have units subject to both NSPS and LAER (table entries 4-6, 9, 14, 16 and 17).

[b] Range of typical BACT limits as determined from the Compilation of BACT/LAER Determinations, revised (450/2-80-070, May 1980), data base BACT determinations and AP-42 emission factors. This range does not encompass all BACT determinations, but indicates the typical values specified for BACT in PSD permits.

[c] The range is for coal fired industrial boilers with less than or equal to 250 MMBtu/hr heat input (not subject to NSPS).

[d] The range is for oil fired industrial boilers with less than 250 MMBtu/hr heat input (not subject to NSPS).

[e] Range is for coal fired boilers with greater than 250 MMBtu/hr heat input (least stringent BACT or LAER is the applicable NSPS).

for PM are in this category. Of these seven, six received LAER limits below the applicable NSPS limit and one received a LAER limit equal to the NSPS. For SO_2 and NO_x, only one unit each was subject to both LAER and NSPS. Both of these units received emissions limits at the NSPS level. Table 5-5 also lists ranges of BACT emissions limits for comparison with the LAER limits. The upper and lower ends of these ranges do not represent the extremes for all BACT determinations made. Rather, they represent "typical" determinations based on BACT limits from the data base (285) PSD permits and EPA's Compilation of BACT/LAER Determinations.

Comparisons of LAER allowable emission rates with BACT ranges show that LAER emissions are generally in the lower portions of the BACT ranges. However, it does not appear that LAER produces a distinguishable level of stringency over BACT.

Total BACT-permitted allowable PM, SO_2, NO_x and CO emissions and emission reductions beyond a NSPS are as follows:

Pollutant	Total BACT-Permitted (tons/year)	Emissions Reductions Beyond NSPS (tons/year)
PM	54,200	7,700
SO_2	761,800	218,700
NO_x	712,400	54,400
CO	159,100	2,970

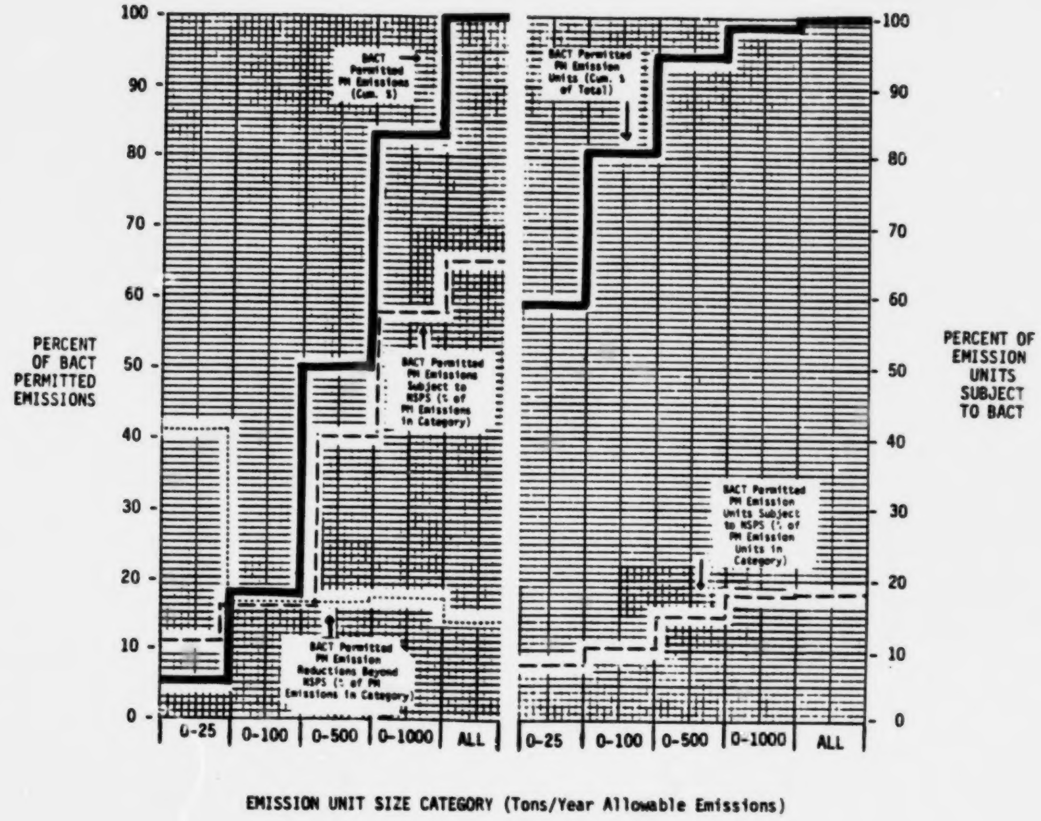
Corresponding values for VOC emission reductions beyond NSPS are not presented since most VOC NSPSs are either equipment or work practice standards and accurate quantification is difficult.

5.5 EFFECT OF EMISSION UNIT SIZE ON BACT-PERMITTED EMISSIONS AND EMISSION REDUCTIONS BEYOND A NSPS

Presented in Figures 5-1 through 5-5 are the distributions of BACT-permitted emissions, BACT-permitted emissions subject to a NSPS, and emission reductions beyond a NSPS. The data are presented by emission unit size category according to the amount of BACT-permitted emissions (in TPY allowable emissions) per emission unit. The data are presented both graphically and in tabular format. The values shown on the upper figure can be calculated from the values in the

Figure 5-1. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: PARTICULATE MATTER (PM)

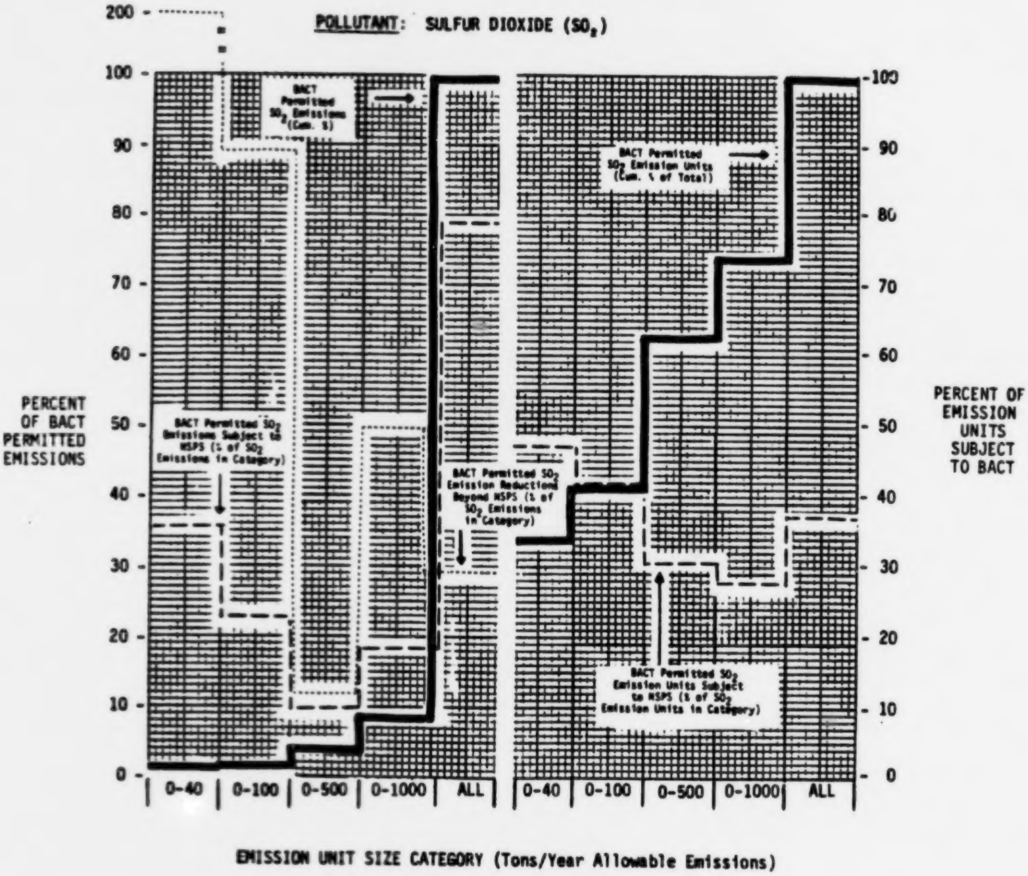


Note: Emission unit size categories in Figure are cumulative whereas they are discrete in Table.

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted PM Emission Units*		BACT-Permitted PM Emissions**		BACT-Permitted PM Emission Units Subject to NSPS		BACT-Permitted PM Emissions Subject to NSPS		PM Emission Reductions Beyond NSPS Subject to BACT***	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all PM emission reductions beyond NSPS	Cum. % of all PM emission reductions beyond NSPS
0 - 25	348	59	59	5	5	8	5	10	<1	14	14
25 - 100	129	22	81	12	17	17	4	18	2	6	20
100 - 500	80	14	95	33	50	39	5	52	17	38	58
500 - 1000	27	4	99	33	83	85	4	86	28	42	100
>1000	5	1	100	17	100	100	1	100	17	0	100

* Total BACT-permitted PM emission units = 589.
** Total BACT-permitted PM emissions = 54,200 tons/year.
***Total BACT-permitted PM emission reductions beyond NSPS = 7,700 tons/year.

Figure 5-2. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT



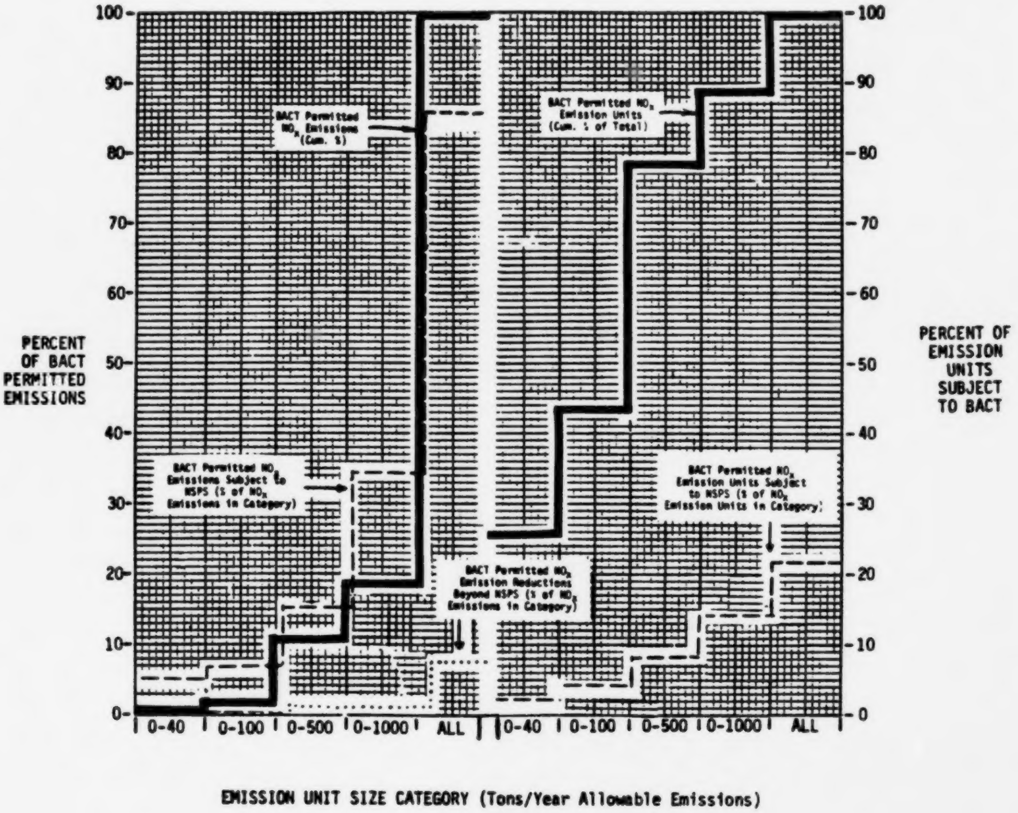
Note: Emission unit size categories in Figure are cumulative whereas they are discrete in Table.

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted SO_2 Emission Units*		BACT-Permitted SO_2 Emissions**		BACT-Permitted SO_2 Emission Units Subject to NSPS		BACT-Permitted SO_2 Emissions Subject to NSPS		SO_2 Emission Reductions Beyond NSPS Subject to BACT***	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all SO_2 emission reductions beyond NSPS	Cum. % of all SO_2 emission reductions beyond NSPS
0 - 40	144	34	34	<1	<1	47	16	35	<1	1	1
40 - 100	30	7	41	<1	<1	17	1	14	<1	<1	1
100 - 500	93	22	63	3	3	9	2	8	<1	<1	1
500 - 1000	49	11	74	5	8	20	2	23	1	13	14
>1000	113	26	100	92	100	59	16	85	78	86	100

* Total BACT-permitted SO_2 emission units = 429.
** Total BACT-permitted SO_2 emissions = 761,800 tons/year.
***Total BACT-permitted SO_2 emission reductions beyond NSPS = 218,700.

Figure 5-3. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: NITROGEN OXIDES (NO_x)



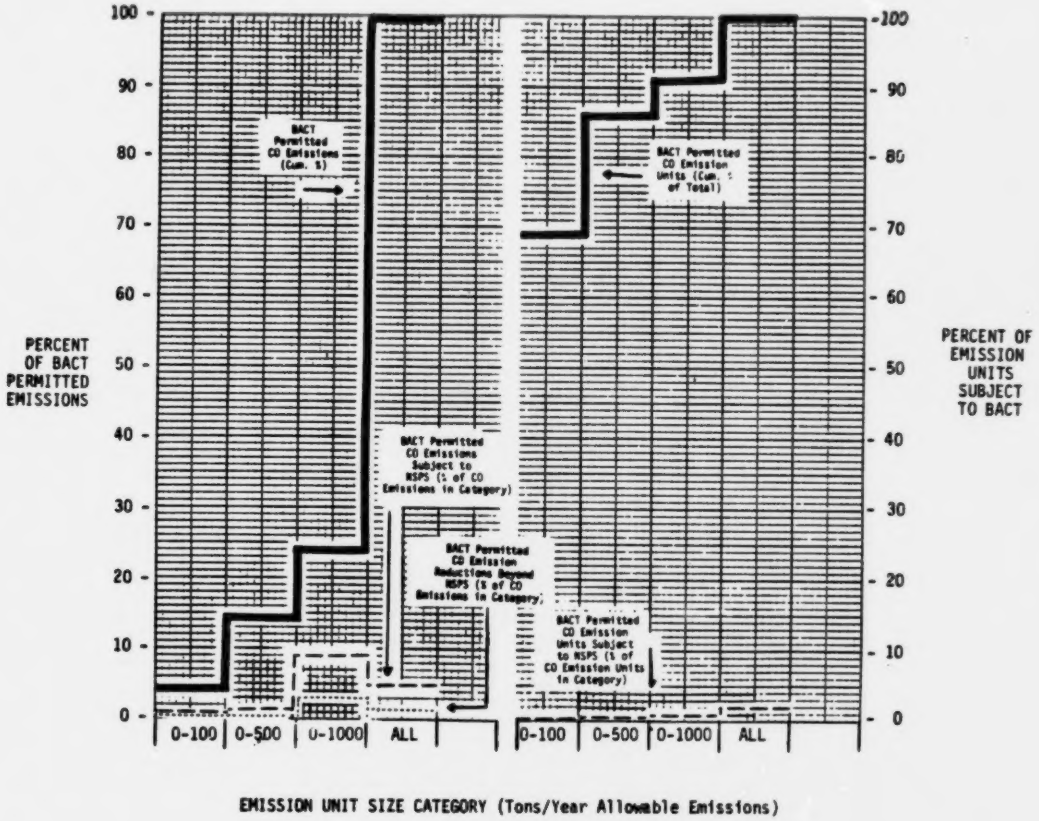
Note: Emission unit size categories in Figure are cumulative whereas they are discrete in Table.

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted NO_x Emission Units*		BACT-Permitted NO_x Emissions**		BACT-Permitted NO_x Emission Units Subject to NSPS		BACT-Permitted NO_x Emissions Subject to NSPS		NO_x Emission Reductions Beyond NSPS Subject to BACT***	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all NO_x emission reductions beyond NSPS	Cum. % of all NO_x emission reductions beyond NSPS
0 - 40	189	26	26	<1	<1	3	<1	5	<1	0	0
40 - 100	122	17	43	1	1	7	1	8	<1	0	0
100 - 500	257	35	78	9	10	13	5	16	1	2	2
500 - 1000	79	11	89	8	18	56	6	59	5	0	2
>1000	80	11	100	82	100	86	9	97	79	98	100

* Total BACT-permitted NO_x emission units = 727.
** Total BACT-permitted NO_x emissions = 712,400 tons/year.
***Total BACT-permitted NO_x emission reductions beyond NSPS = 54,400 tons/year.

Figure 5-4. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: CARBON MONOXIDE (CO)



__Note__: Emission unit size categories in Figure are __cumulative__ whereas they are __discrete__ in Table.

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted CO Emission Units*		BACT-Permitted CO Emissions**		BACT-Permitted CO Emission Units Subject to NSPS		BACT-Permitted CO Emissions Subject to NSPS		CO Emission Reductions Beyond NSPS Subject to BACT***	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all CO emission reductions beyond NSPS	Cum. % of all CO emission reductions beyond NSPS
0 - 100	297	69	69	4	4	0	0	0	0	0	0
100 - 500	71	17	86	10	14	1	<1	2	<1	0	0
500 - 1000	20	5	91	10	24	20	1	20	2	45	45
>1000	39	9	100	76	100	5	<1	3	3	55	100

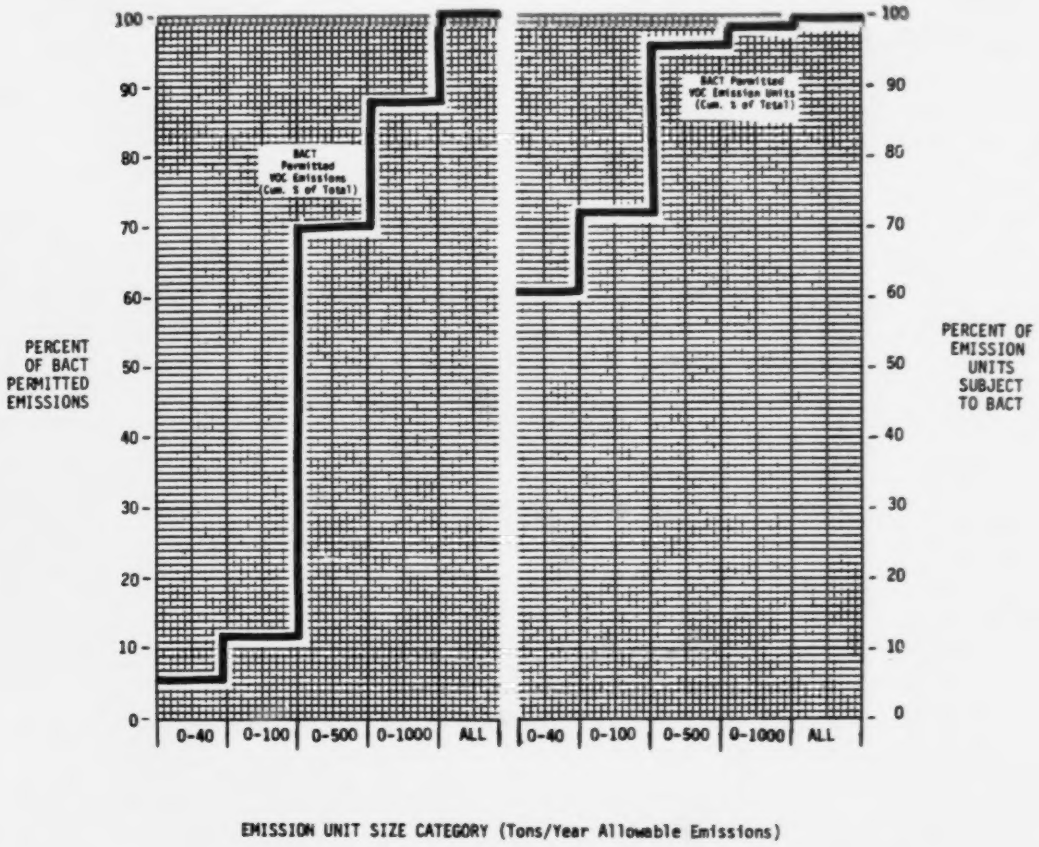
* Total BACT-permitted CO emission units = 427.

** Total BACT-permitted CO emissions = 150,100 tons/year.

***Total BACT-permitted CO emission reductions beyond NSPS = 2,970 tons/year.

Figure 5-5. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: VOLATILE ORGANIC COMPOUNDS (VOC)



Note: Emission unit size categories in Figure are cumulative whereas they are discrete in Table.

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted VOC Emission Units*		BACT-Permitted VOC Emissions**	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total
0 - 40	88	61	61	6	6
40 - 100	16	11	72	6	12
100 - 500	35	24	96	58	70
500 - 1000	4	3	99	18	88
>1000	1	1	100	12	100

* Total-BACT permitted VOC emission units = 144.
** Total-BACT permitted VOC emissions = 13,700 tons/year.

Note: VOC NSPS's are generally work practice or equipment standards. Unable to quantify VOC emissions subject to a NSPS.

table, but they are not direct plots of the tabular values. As noted on the figure, the upper chart uses cumulative size categories, whereas the table displays discrete size categories.

To illustrate the use of Figures 5-1 through 5-5, consider in Figure 5-1, PM emission units in the 0-25 TPY size range. As shown in the figure, about 59% (348) of all BACT-permitted PM emission units are less than 25 tons/year in size. These 348 emission units represent about 5% (about 2710 TPY) of the total BACT-permitted PM emissions in the data base. In the 0-25 TPY size range, approximately 8% (28 out of 348) of the PM emission units were subject to NSPS. These 28 emission units are about 5% of the total number of BACT-permitted PM emission units (28 is approximately 5% of 589) in the data base. Also, the 28 emission units subject to a NSPS represent approximately 10% (about 271 TPY) of the BACT-permitted PM emissions in the size class and <1% of the total BACT-permitted PM emissions. Additionally, the 28 emission units represent approximately 14% (about 1078 TPY) of the total BACT-permitted emission reductions beyond a NSPS.

Only five PM emission units (1% of total) were permitted to emit greater than 1000 tons/year of PM. All five of these were subject to NSPS and were permitted at the maximum emission rate allowed by the NSPS (therefore, no emission reductions beyond NSPS were realized for this size class). The size class of 100-500 tons/year and 500-1000 tons/year produced the majority (80%) of emission reductions beyond a NSPS. The NSPS emission units in these size categories were permitted to emit about 24,400 tons/year of PM (17% + 28% = 45% of 54,200 tons/year), some 6100 tons/year of PM less than the level allowed by the NSPS.

In contrast to PM, Figure 5-2 shows that about 26% of all SO_2 emission units were in the size class of greater than 1000 TPY. However, 92% (about 700,856 TPY) of all BACT-permitted SO_2 emissions were in this size class. Furthermore, the majority (86%) of SO_2 emission reductions beyond NSPS were achieved in this size class. The greater than 1000 TPY size class generally consists of utility and large industrial boilers. Some industrial boilers in this size class were not subject to NSPS because of their heat input (less than 250 MMBtu/hr). Note that the 0-40 tons/year size class consists of 34% of all SO_2 emission units; whereas the corresponding SO_2 emissions for these units are less than 1% of the total SO_2 emissions in the data base. Additionally, 47% of the emission units in this size category were subject to NSPS. These small (0-25 TPY) NSPS emission units consist mainly of heaters, boilers and furnaces at petroleum refineries burning refinery fuel gas.

Figure 5-3 for NO_x emissions is similar to Figure 5-2 for SO_2 emissions in that the majority of allowable emissions and emission reductions beyond a NSPS occurred at emission units greater than 1000 tons/year in size.

5.6 PROPOSED VS. PERMITTED BACT

Data from the PSD permits and corresponding PSD applications were extracted to determine where permitted BACT allowable emission rates are different than those originally proposed by the PSD applicant. Furthermore, the differences in these values were determined.

Permitted BACT (non-NSPS) was found to be different than proposed BACT in 63 PSD permits (23 percent of all data base applications). The majority of proposed versus permitted BACT limit changes resulted in emission reductions. However, in some cases, small emission increases did result. Factors such as air quality impacts, increment consumption and case-by-case evaluations served to influence the permitting authorities' decision making process.

In most cases, the change made in the BACT determination was to reduce the allowable emission limit while employing the same control technology. This usually required an improvement in the operating efficiency of the control device. In other cases, the regulatory authority simply imposed the NSPS emission limit if the applicant had failed to do so. In some cases, permitted emissions were increased over those proposed in the application because the original limit was considered unrealistically low.

5.7 EFFECT OF PSD ON ALLOWABLE EMISSIONS

It is impossible to determine the levels at which the data base sources would have been allowed to emit in the absence of PSD provisions. For example, for sources not subject to NSPS, an applicant might have proposed and been allowed to emit pollutants at the levels prescribed in the respective State Implementation Plan (SIP). In other cases, however, an emissions limiting factor may have been the NAAQS ceilings, or other air quality factors. Quantification of these "upper bounds" for non-NSPS sources was beyond the scope of this project.

However, some measure of the effect of the NSR program can be obtained by considering only: sources that were subject to NSPS; and sources which were not subject to NSPS but had to adopt BACT limits more stringent than those proposed in their original application. For the various pollutants, reductions from "hypothetical" NSPS levels (i.e., those levels at which the source would be allowed to emit if it were just to meet NSPS requirements) and reductions for other sources representing the difference between proposed and final BACT are shown in Table 5-6. These "reductions" expressed as a percentage of the hypothetical/proposed level for the criteria pollutants are:

PM - 17%
SO_2 - 25%
NO_x - 8%
CO - 4%

Expressed as a percentage of the final permitted BACT emissions, these reductions are:

PM - 24%
SO_2 - 33%
NO_x - 8%
CO - 4%

That is, in the absence of the PSD program, PM emissions could have been about one-fourth higher than the permitted PM emissions and SO_2 emissions about one-third higher than the permitted SO_2 emissions.

Table 5-6. **CUMULATIVE BACT PERMITTED EMISSIONS REDUCTIONS ASSOCIATED WITH PSD**

	Pollutant									
	PM	SO_2	NO_x	CO	VOC	H_2S	F	TRS	Acid Mist	Vinyl Chloride
Emissions reductions beyond NSPS - tons/yr	7,700	218,700	54,400	2,970	N/A	0	240	1	2	
Non-NSPS emissions reductions associated with proposed vs. permitted BACT - tons/yr	5,100	34,200	5,100	3,000	N/A	0	0	0	0	
Total emissions reductions - tons/yr	12,800	252,900	59,500	5,970	N/A	0	240	1	2	
Total BACT-permitted emissions - tons/yr	54,200	761,800	712,400	159,100	13,700	700	810	1,160	180	110

6.0 ANALYSIS OF AIR QUALITY IMPACTS

6.1 INTRODUCTION

A prerequisite for obtaining a PSD permit is the demonstration that a proposed project will not cause or contribute to a violation of an allowable PSD increment or a National Ambient Air Quality Standard (NAAQS). This section deals with four basic aspects of the PSD program as they relate to air quality compliance demonstrations. These are:

1. Compliance with allowable PSD increments;
2. Ambient monitoring;
3. Compliance with NAAQS; and
4. Class I area impacts.

Analyses of the data base applications were performed to identify the following:

1. Frequency of required air quality analyses;
2. Methods by which existing ambient air quality concentrations were determined;
3. Source consumption of PSD increments;
4. Source impacts on NAAQS;
5. Cases where Class I area impacts played a major role in the permitting process; and
6. Effects of air quality constraints on emissions reductions beyond NSPS.

The methods and assumptions used in these analyses are provided in Appendix F.

6.2 FREQUENCY OF AIR QUALITY ANALYSES

Source Applicability

Of the 285 data base applications, 213 were required to perform air quality (A/Q) impacts analyses. Seventy-two (72) applications subject to the 1978 PSD regulations were not required to perform air quality impacts because as mentioned previously, these regulations provided exemptions from air quality and other analyses (such as BACT, etc.) for applications subject only to abbreviated review (such as "Tier 1", "no net increase", etc.). Shown below is the percent of data base applications subject to air quality review under the 1978 and 1980 PSD regulations by the number of pollutants per application:

Percent of PSD Applications Subject to Air Quality Review	Number of Pollutants Per Application Subject to Air Quality Review				
	1	2	3	4	Total
Under 1978 PSD regulations	45%	23%	22%	10%	100%
Under 1980 PSD regulations	28%	23%	28%	21%	100%
Average	40%	23%	24%	13%	100%

As can be seen, there was a greater frequency of 1-pollutant A/Q reviews under the 1978 PSD regulations than under the 1980 PSD regulations. This trend can be correlated to the applicability criteria of the PSD regulations and is further analyzed in the Pollutant Applicability Section below.

Air quality reviews were generally not required in cases involving nonattainment pollutants. The applicable nonattainment provisions simply required that a "net air quality benefit" demonstration be made after applying LAER and obtaining required emissions "offsets". Therefore, the remainder of this section addresses only those A/Q reviews subject to PSD.

Pollutant Applicability

Table 6-1 shows the frequency of pollutants subject to an A/Q review by the number of pollutants per PSD application required to undergo such analyses. Shown below are the changes in pollutant-specific involvement in A/Q reviews under both the 1978 and 1980 PSD regulations:

Pollutant	% of all Air Quality Reviews	
	1978 Regulations	1980 Regulations
PM	18	22
SO_2	25	29
NO_x	39	33
CO	15	15
VOC	1	1
Fl	1	0
H_2S	1	0
	100	100

Table 6-1. DISTRIBUTION OF AIR QUALITY REVIEWS PER PSD APPLICATION BY POLLUTANT

No. of Pollutants Subject to Air Quality Review per PSD Application	Pollutants Subject to Air Quality Review							
	PM	SO_2	NO_x	CO	VOC	Fl	H_2S	Total
1	6	16	52	9	0	0	1	84
2	12	34	36	16	0	0	0	98
3	43	45	48	14	2	1	0	153
4	29	29	27	28	1	1	1	116
TOTAL	90	124	163	67	3	2	2	451
% of Total A/Q Reviews -	20%	27%	36%	15%	<1%	<1%	<1%	-

As can be seen, it appears that NO_x air quality reviews played a lesser role (relatively) in the 1980 regulations compared to the 1978 regulations. This is probably due to greater frequencies of PM and SO_2 reviews rather than less frequent NO_x air quality reviews. This is demonstrated by the data in Section 2.0 which shows that the 1980 regulations focused more on PM ard SO_2 than did the 1978 regulations.

Note in Table 6-1 that only three PSD applications provided A/Q analyses for VOC emissions. Because of the lack of acceptable dispersion modeling techniques, air quality reviews for the purpose of determining VOC emissions impacts on ozone concentrations generally have not been required. Although primary and secondary NAAQS exist for VOC, the standard is for use as a guide in devising implementation plans to achieve the ozone standard. The three data base VOC A/Q reviews involved a petroleum refinery, a crude oil production facility and a brewery.

Table 6-1 also shows four A/Q reviews for non-criteria pollutants - hydrogen sulfide (H_2S) and fluorides (Fl). The fluorides analyses were conducted to predict ambient impacts of this pollutant for two proposed new aluminum smelters in EPA Region IV. The two hydrogen sulfide analyses were associated with a crude oil production facility and a geothermal steam electric plant in EPA Regions VIII and IX, respectively.

Frequency of Required Monitoring Data

Of the 213 data base applications subject to PSD A/Q review, representative "background" concentrations for the pollutants involved in the reviews were provided according to the following distribution:

1. Site specific ambient monitoring data - 39 cases (18%);
2. State or EPA (SLAMS or NAMS) monitoring data - 54 cases (25%);
3. Other ("modeled" background; rural background; etc.) - 120 cases (57%).

The "other" category consists of those cases where:

1. Sources (existing or proposed) are located in "remote" areas and the PSD applicant used "assumed rural" background values approved by EPA in the air quality analyses;
2. Sources determined pollutant background concentrations predominantly by dispersion modeling; and

3. The proposed project was determined to "insignificantly" impact ambient air quality. In these cases, the applicant was required to only demonstrate the source location was "attaining" the respective NAAQS.

The determination of ambient pollutant background concentrations by dispersion modeling in many cases was generally regarded as conservative because allowable, rather than actual, emissions were used in the analyses.

Table 6-2 shows those data base applications where site specific monitoring data were provided by source category and EPA region. The 39 identified applications that provided site specific monitoring data constitute 18% of all applications subject to air quality review and 14% of all data base applications.

Table 6-3 shows the distribution of site specific ambient monitoring data by source category and number of pollutants per PSD application. Utilities generally provided this data for at least two pollutants and aluminum smelters generally provided this data for ambient SO_2 and fluorides concentrations. Two PSD applications for petroleum refineries provided ambient monitoring data for four and five criteria pollutants.

Table 6-4 shows the distribution of site specific ambient monitoring data by pollutant. Sulfur dioxide was the pollutant most frequently monitored, being involved in 30 of the 39 cases.

6.3 ANALYSIS OF ALLOWABLE PSD INCREMENTS

Allowable PSD increments are limits of ambient PM and SO_2 concentrations above a "baseline" air quality concentration. Increment consumption analyses for proposed PM and/or SO_2 emissions are required for comparison to the allowable increments, and compliance must be demonstrated in order to be eligible for a PSD permit. These increments are different for Class I, II and III areas although most analyses involve Class II area criteria. Except where noted, this section deals with Class II increment analyses.

Increment Consumption

Figures 6-1 and 6-2 show the distributions of projected maximum PM and SO_2 increment consumption for all data base A/Q analyses. There are "significance" levels of increased pollutant concentrations below which detailed analyses are unnecessary. To show "insignificant" impacts

Table 6-2. SITE SPECIFIC PRECONSTRUCTION MONITORING BY REGION AND BY SOURCE CATEGORY

Source Type	EPA Region 1	2	3	4	5	6	7	8	9	10	Total	Percent of Data Base Source Category
Steam Electric Plants (Utility)	1		1	2	1		2	2	4		13	33%
Portland Cement Plants								1			1	20%
Aluminum Smelter		2		2							4	57%
Petroleum Refineries		1				2		1	1	2	7	27%
Chemical Process Plants				1		2				1	4	11%
Rubber Production Plant				1							1	33%
Brewery			1								1	20%
Glass Manufacturing Plant									1		1	25%
Surface Mining								1	1		2	22%
Crude Oil Production								2		1	3	7%
Military Installations (Boilers)								1		1	2	33%
TOTAL	1	3	2	6	1	4	2	8	7	5	39	
Percent of All Data Base Applications in Region	6%	10%	7%	13%	3%	9%	13%	30%	30%	19%		

Table 6-3. SITE SPECIFIC PSD PRE-CONSTRUCTION AMBIENT MONITORING REQUIREMENTS BY NUMBER OF POLLUTANTS PER PSD APPLICATIONS AND SOURCE TYPE

Source Type Subject to Pre-construction Monitoring	Number of Pollutants Per PSD Application Subject to Pre-construction Monitoring					
	1	2	3	4	5	Total
Steam Electric Utilities	0	7	6	0	0	13
Petroleum Refineries	3	2	0	1	1	7
Chemical Process	3	0	1	0	0	4
Primary Aluminum	1	3	0	0	0	4
Portland Cement	0	1	0	0	0	1
Surface Mining	2	0	0	0	0	2
Rubber Production	1	0	0	0	0	1
Glass Manufacturing	0	1	0	0	0	1
Crude Oil and Gas	0	2	1	0	0	3
Brewery	1	0	0	0	0	1
Military Installations	1	1	0	0	0	2
	12	17	8	1	1	39

Table 6-4. SITE SPECIFIC PSD PRE-CONSTRUCTION AMBIENT MONITORING CASES BY POLLUTANT TYPE AND FREQUENCY

Number of Pollutants Involved in Pre-Construction Monitoring	Number of Cases	Frequency of Pollutants Involved in Pre-Construction Monitoring					
		PM	SO_2	NO_x	CO	O_3	Fl
1	12	2	5	2	2	1	0
2	17	9	16	8	0	0	1
3	8	8	7	7	1	0	1
4	1	1	1	1	1	0	0
5	1	1	1	1	1	1	0
Total	39	21	30	19	5	2	2

FIGURE 6-1. DISTRIBUTION OF MAXIMUM CONCENTRATIONS OF CLASS II PM INCREMENT CONSUMPTION FOR ALL DATA BASE PM AIR QUALITY REVIEWS.

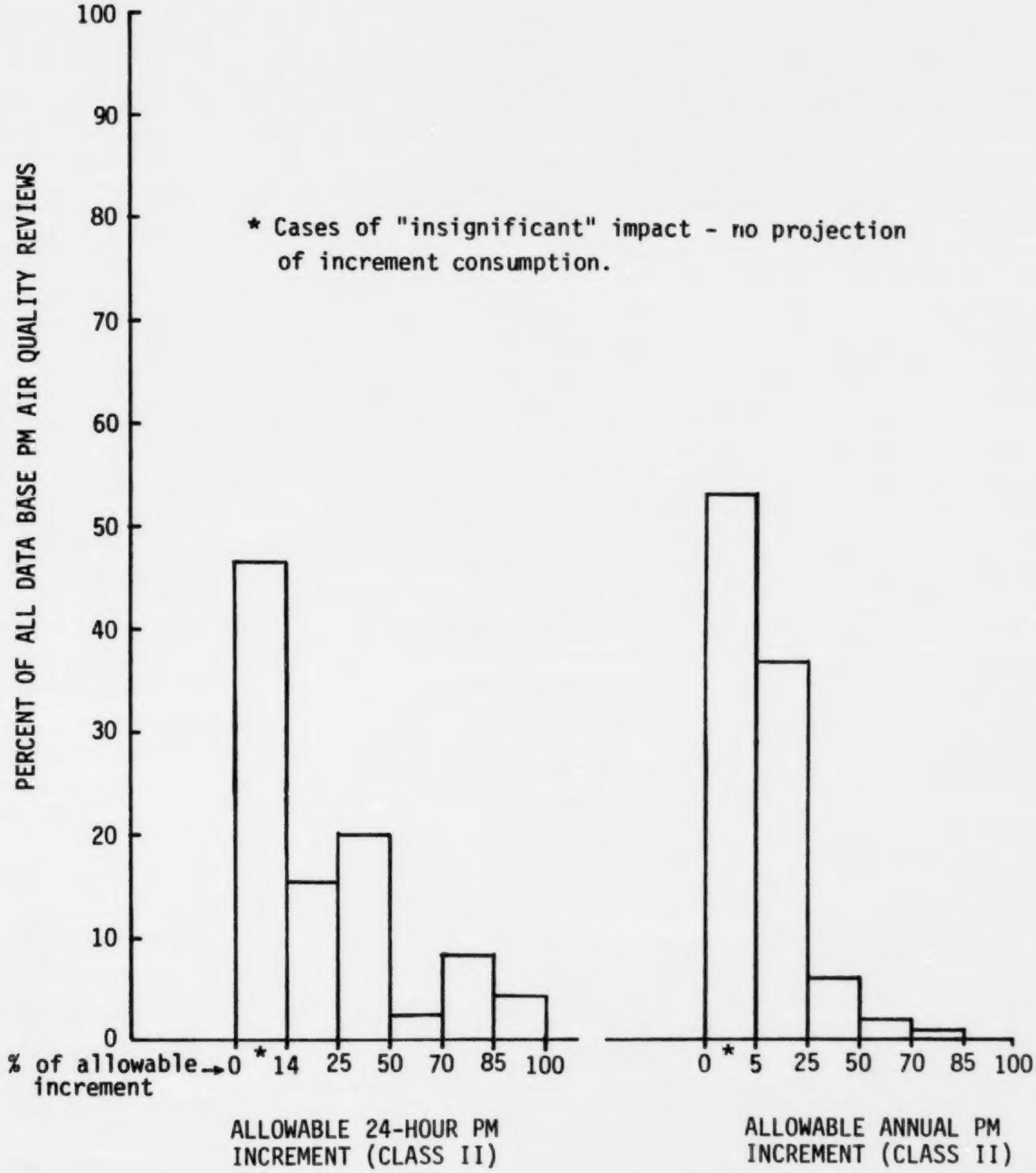
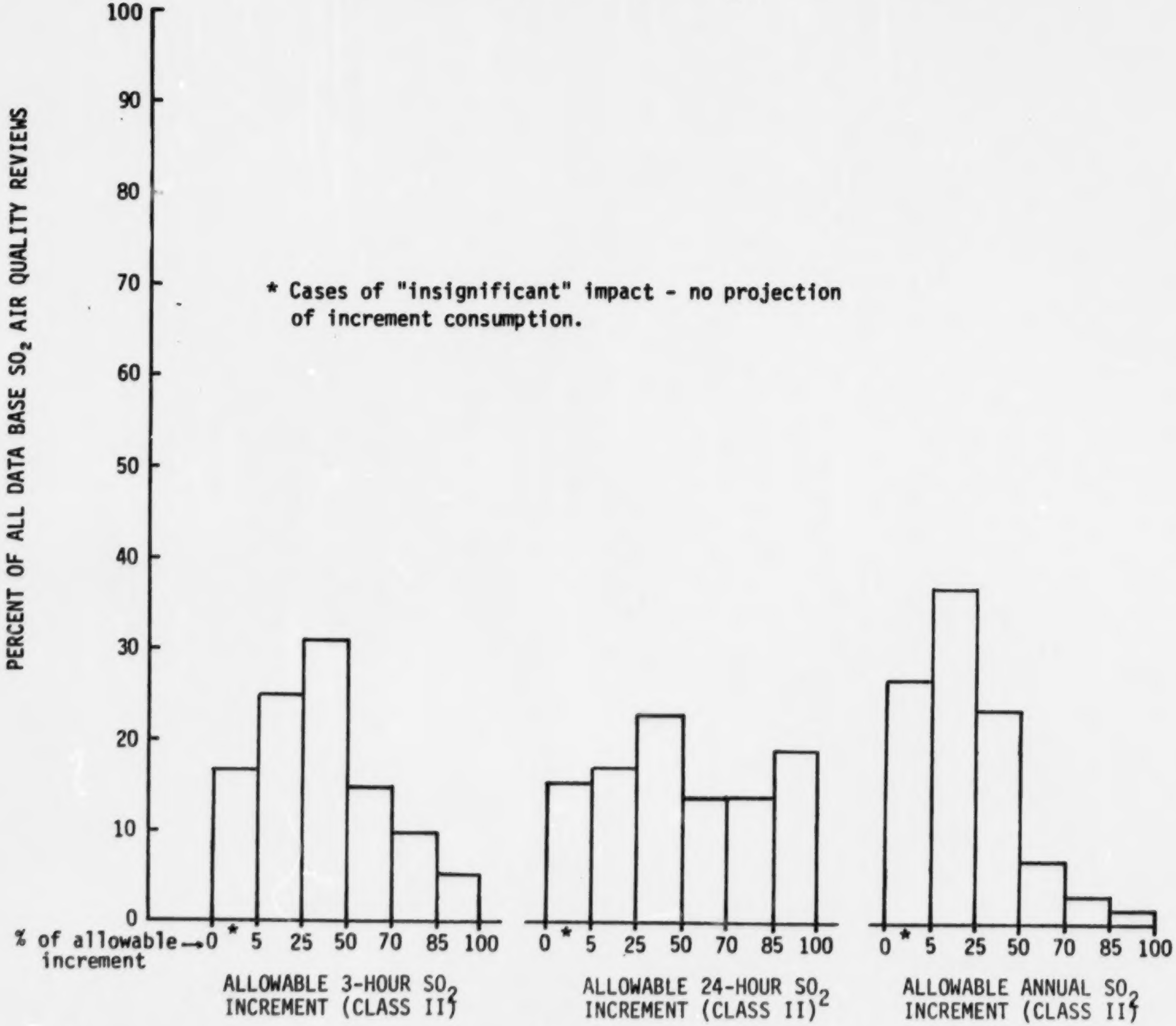


FIGURE 6-2. DISTRIBUTION OF MAXIMUM CONCENTRATIONS OF CLASS II SO_2 INCREMENT CONSUMPTION FOR ALL DATA BASE SO_2 AIR QUALITY REVIEWS.[2]



* Cases of "insignificant" impact - no projection of increment consumption.

means that the combination of a source's proposed PM and/or SO_2 emissions increases and their dispersion characteristics (stack height, velocity, etc.) under worst case conditions will not produce ambient impacts above these "significance" levels. These levels are:

Pollutant	Averaging Time 3-hour	 24-hour	 Annual
PM	-	5 ug/m^3	1 ug/m^3
SO_2	25 ug/m^3	5 ug/m^3	1 ug/m^3

For those cases where "significant" impacts are predicted for the proposed emissions, more detailed analyses are required. When more detailed analyses are required, the significance levels shown above are used to determine the area of impact to be analyzed for each subject pollutant. An impact area for each pollutant is determined by the greatest distance from the source to which dispersion modeling shows the proposed emissions will have a "significant" impact. As shown in Figure 6-1 and 6-2, about 50% of the PM increment analyses predicted "insignificant" impacts whereas this was the case for about 20% of the SO_2 analyses. For these pollutants, insignificant impacts were predicted more for the annual time averaging periods than for the short-term periods.

Figure 6-1 shows that the majority of PM increment analyses predicted less than 50% consumption of the allowable increment, whereas Figure 6-2 shows fewer cases of low SO_2 increment consumption. As shown in Figure 6-2, more than 1/3 of the 24-hour SO_2 increment analyses showed more than 70% of the allowable consumed. Nineteen percent of the 24-hour SO_2 increment analyses were predicted to consume more than 85% of the allowable increment whereas 85% increment consumption was predicted in less than 6% of each of the other SO_2 or PM increment analyses. This indicates that the 24-hour SO_2 increment was most limiting of all the increment standards. In fact, 21 cases projected more than 90% consumption of the allowable SO_2 increment whereas only one case showed this for PM and that was a case where more than 90% of the 3-hour and annual SO_2 allowable increment were also projected to be consumed.

Class II Increment Consumption Impacts by Source Type and EPA Region

An analysis was conducted to correlate source type and EPA region with data base applications where the A/Q analyses showed greater than 70% of the available Class II increment to be consumed. Table 6-5 presents the distribution of those cases, by source type and by EPA region. As can be seen, utilities required more than 70% of the allowable increment (SO_2, in most cases) in 46% of the cases. Additionally, about one-third of the PSD applications in EPA Regions IV and VI projected greater than 70% of the allowable increment to be consumed. It must be understood that increment consumption reported in PSD applications, in most cases, represents the maximum worst case impacts (highest, 2nd-highest in other cases) predicted by dispersion modeling. These values apply to modeled receptors and should not be regarded to indicate increment consumption spanning large areas.

Effects of Allowable PSD Increment Constraints

The most limiting air quality factor was the allowable 24-hour SO_2 increment of 91 ug/m^3. As shown below, except for this case, very few A/Q analyses predicted that more than 85% of the respective allowable PSD increment would result from the proposed project.

	Pollutant/Increment Averaging Period				
	PM		SO_2		
	24-hr	Annual	3-hr	24-hr	Annual
% of Analyses Where More Than 85% Increment Consumption was Predicted	5%	0%	6%	19%	2%
% of A/Q Analyses That Showed "Insignificant" Ambient Impacts	47%	54%	17%	15%	27%

In those cases where preliminary A/Q analyses indicated "insignificant" ambient impacts, detailed increment consumption analyses were not performed. Therefore, the degree of increment consumed by all emissions in the vicinity of those sources was not reported in the PSD application. Therefore, in those cases where insignificant impacts were predicted, it was impossible to determine the amount of PSD increment consumed in the vicinity of those sources.

Table 6-5. DISTRIBUTION OF DATA BASE CASES WITH GREATER THAN 70% OF CLASS II INCREMENT CONSUMPTION OF EITHER PM OR SO_2 (OR BOTH) BY SOURCE TYPE AND EPA REGION

Source Category	EPA Region										Total	% of All Sources in Category
	I	II	III	IV	V	VI	VII	VIII	IX	X		
Power plants >250 x 10^6 BTU/hr heat input	1	-	2	2	3	4	-	3	3	-	18	46%
Coal cleaning plants	-	-	-	-	1	-	-	-	-	-	1	50%
Kraft pulp mill	-	-	-	2	-	-	-	-	-	-	2	14%
Portland cement plant	-	-	-	-	-	2	-	-	-	-	2	40%
1^0 aluminum ore reduction plants	-	-	-	2	-	-	-	-	-	-	2	29%
Petroleum refineries	-	-	1	-	-	2	-	-	1	1	5	19%
Carbon black plants	-	-	-	-	-	2	-	-	-	-	2	67%
Fuel conversion plants	-	-	-	-	-	-	1	-	-	-	1	100%
Chemical process plants	-	-	-	2	-	2	-	-	-	-	4	11%
Brewery	-	-	1	-	-	-	-	-	-	-	1	20%
Other mining	-	-	-	-	-	-	-	-	1	-	1	50%
Natural gas & crude oil production	-	-	-	-	-	-	-	1	-	-	1	2%
Other	-	-	-	-	1	-	-	-	-	-	1	25%
Textile manufacturing	-	-	-	1	-	-	-	-	-	-	1	100%
Lumber and wood products manufacturing	1	-	-	1	-	1	-	-	-	-	3	38%
Natural gas plants	-	-	-	-	-	-	-	-	1	-	1	33%
Graphite electrode plant	-	-	1	-	-	-	-	-	-	-	1	50%
Automotive part manufacturing	-	-	-	1	-	-	-	-	-	-	1	14%
Kaolin processing	-	-	-	1	-	-	-	-	-	-	1	100%
Food processing	-	-	-	2	-	-	-	-	-	-	2	40%
TOTAL	2	0	5	14	5	13	1	4	6	1	51	
% of all PSD applications in region	12%	0%	17%	31%	16%	33%	7%	15%	26%	4%		

Project alterations were made in at least 28 cases (13% of applications required to perform increment analyses) to avoid violations of the allowable Class II increments that could have precluded permit issuance. Those alterations are distributed as shown below:

	Alteration	# of Cases	Limiting Factors
1.	More Stringent BACT	11	3-hr SO_2 (2); 24-hr SO_2 (7); 24-hr PM (2)
2.	Increase Stack Height	5	3-hr SO_2 (1); 24-hr SO_2 (4)
3.	Switch to Cleaner Fuel	3	24-hr PM (1); needed insignificance (2)
4.	Emission Reductions Elsewhere	3	24-hr SO_2 (3)
5.	Limit Hours of Operation	1	Unknown
6.	Other	5	Unknown

As shown above, the allowable Class II 24-hr SO_2 increment caused project alterations resulting in lower emissions in 14 cases which is 11% of all SO_2 air quality reviews. This analysis only deals with corrective action documented in the PSD permit file. No attempt was made to identify cases where alterations were made prior to submitting the PSD application. Therefore, it is difficult to estimate the quantity of emissions reductions attributable to the increments. (See, however, discussion in Section 6.7.) From the available data, increments appeared to have caused project alterations in at least 10% of the data base PSD applications.

Role of Increment Impacts Analyses on Specific Projects

To determine the results that increments have produced on specific projects, an analysis was performed of those PSD applications that predicted more than 90% consumption of an allowable increment. As shown in Table 6-6, 24 cases where increment consumption was greater than 90% of the allowable were identified. Of the 24 sources analyzed, 18 were contained in the data base and six were identified by EPA regional office personnel. Twenty-one (21) of the sources analyzed consumed 90% of the increment solely due to emissions from the project under review. Also, 12 of the 24 sources were located in complex terrain areas. In 13 of the 24 cases analyzed, increment violations were originally predicted by using either EPA screening or refined (or combination of both) modeling analyses.

Table 6-6. PSD PERMIT APPLICATIONS REQUIRING GREATER THAN 90% OF THE PSD INCREMENT

Source Name	Region	Source Type - Project Description	TRW Data Base Source	Pollutant Averaging Time - % Consumption	Computer Dispersion Model(s) Used	Complex Terrain	Did the Source Alone Consume 90% of the Increment?	Amount of Emission Reduction Beyond a NSPS (tons per year)	Comments
Westmoreland Coal Company	3	New coal preparation plant - project is not yet constructed	no	PM - 24 hr. - 96%	VALLEY	yes	yes	unknown	Original modeling showed increment violations. Solution was to separate stacks, raise stack height and enforce hours of operation limitation.
Airco Speer	3	New graphite electrode manufacturing plant	no	PM - 24 hr. - 95%	ISC	no	yes	N/A	--
Celanese Fibers	3	Chemical plant - addition of 190 MMBtu/hr heat input coal fired boiler	no	SO_2 - 24 hr. - 93%	VALLEY	yes	yes	N/A	--
Hampton Roads Energy Company	3	New 186,000 BPD crude oil refinery and marine terminal	yes	SO_2 - 24 hr. - 99%	CRSTER, RAM, CDM	no	yes	SO_2 - 1,314 PM - 99 NO_x - 310	Original modeling showed increment violation. Source obtained offsets to reduce increment consumption.
Adolph Coors	3	New Brewery	yes	SO_2 - 24 hr. - 99%	LAPPES, CRAMER	no	yes	0	A Class I increment violation was predicted using the CRAMER model. Remodeling using the LAPPES model showed 99% consumption.
General Battery	3	Battery manufacturing - addition of a reverberating furnace	no	SO_2 - 24 hr. - 96%	VALLEY	yes	yes	N/A	--
Mettiki Coal	3	Coal preparation plant - addition of a thermal dryer	no	PM - 24 hr. - 95%	VALLEY	yes	yes	PM - 20	Original modeling showed increment violations. Solution was to increase PM controls and limit hours of operation.

(continued)

Table 6-8. Continued

Source Name	Region	Source Type - Project Description	TRW Data Base Source	Pollutant Averaging Time - % Consumption	Computer Dispersion Model(s) Used	Complex Terrain	Did the Source Alone Consume 90% of the Increment?	Amount of Emission Reduction Beyond a NSPS (tons per year)	Comments
Coastal Aluminum	4	New 200,000 ton/year aluminum manufacturing plant	yes	SO_2 - 24 hr. - 91%	CRSTER	no	yes	F - 107	--
Abbitibi Corporation	4	Exterior hardboard manufacturing - addition of a 180 MMBtu/hr heat input wood waste boiler and material handling facilities	yes	SO_2 - 24 hr. - 92%	CRSTER, VALLEY	yes	yes	N/A	Original modeling showed increment violations. Solution was to restrict the amount of fuel oil to be consumed at the plant.
St. Regis Paper Company	4	Kraft pulp mill - convert #3 and #4 power boilers from oil/gas/wood firing to oil/gas/wood/coal firing	yes	SO_2 - 24 hr. - 99%	AQDM, CRSTER, VALLEY	yes	yes	0	Original screening analysis showed increment violations. Solution was to raise stack height and perform a refined modeling analysis.
Degussa Chemical Company	4	Chemical plant - increase hours of operation of an existing boiler to full capacity	yes	SO_2 - 24 hr. - 96%	PTMAX, CRSTER, COMPTER	no	yes	N/A	--
Alabama Electric Company	4	New power plant - 4 new 480 MWe coal fired boilers	yes	SO_2 - 24 hr. - 96%	CRSTER, RAM, COMPTER	no	yes	0	--
Chevron	4	New docking facility for an oil refinery	no	SO_2 - 24 hr. - 96%	CRSTER, MULTI-CRSTER, CDM	no	yes	N/A	Increment violations were caused by ships docking at both old and new docking facilities simultaneously. Solution was to limit docking to one ship at a time.
Central Illinois Light Company	5	Power plant - addition of 2 - 413 MWe coal fired boilers	yes	SO_2 - 24 hr. - 94%	CRSTER	no	yes	SO_2 - 15,226 NO_x - 3,625	High increment consumption forced the source to increase emission controls.

(continued)

Table 6-8. Continued

Source Name	Region	Source Type - Project Description	TRW Data Base Source	Pollutant Averaging Time - % Consumption	Computer Dispersion Model(s) Used	Complex Terrain	Did the Source Alone Consume 90% of the Increment?	Amount of Emission Reduction Beyond a NSPS (tons per year)	Comments
City of Columbus	5	New power plant - 6 new 23 MWe refuse and coal fired boilers	yes	SO_2 - 24 hr. - 100%	CRSTER	no	yes	N/A	Initial modeling showed increment violations. Solution was to raise stack heights and reduce emissions.
Consolidation Coal Company	5	Coal preparation plant - addition of a 63 MMBtu/hr heat input coal fired thermal dryer	yes	SO_2 - 3 hr. - 90%	CRSTER	no	no	PM - 7	--
Crystal Oil Company	6	Petroleum Refinery - increase from 15,000 to 30,000 bbl/day	yes	SO_2 - 24 hr. - 91% SO_2 - annual - 95%	ISCST, ISCLT	no	yes	PM - 5	Original modeling showed increment violations. Solution was to limit the amount of sulfur in the oil.
Plains Electric Company	6	New power plant - one 243 MWe coal fired boiler	yes	SO_2 - 24 hr. - 98%	CRSTER, VALLEY	yes	yes	PM - 747 SO_2 - 4,200 NO_x - 2,650	Initial modeling with VALLEY showed increment violations. Solution was to lower emission levels beyond NSPS limits.
American Modern Food Systems	7	New ethanol plant - one 180 and two 95 MMBtu/hr heat input oil fired boilers	yes	SO_2 - 24 hr. - 95%	ISC	no	no	N/A	Ames Medical Power Plant (AMP, nearby) was in violation of increment and NSPS limits. The AMP plant was directly downwind of American Modern Food Systems, thus resulting in high increment consumption.
Martin Marietta Cement	8	New Portland Cement Plant	yes	SO_2 - 3 hr. - 98% SO_2 - annual - 91%	VALLEY	yes	yes	0	--
Colorado UTE Power and Light	8	Power plant - addition of one 427 MWe coal fired boiler	yes	SO_2 - 24 hr. - 92%	VALLEY	yes	yes	SO_2 - 7,669	Original modeling showed increment violations. Solution was to remodel using a refined analysis.
Provident Energy Company	9	New 50,000 bbl/day petroleum refinery	yes	SO_2 - 24 hr. - 99%	.VALLEY	yes	yes	0	--

(continued)

Table 6-8. Concluded.

Source Name	Region	Source Type - Project Description	TRW Data Base Source	Pollutant Averaging Time - % Consumption	Computer Dispersion Model(s) Used	Complex Terrain	Did the Source Alone Consume 90% of the Increment?	Amount of Emission Reduction Beyond a NSPS (tons per year)	Comments
Nevada Power Company	9	Power plant - addition of one 880 MMBtu/hr heat input fuel oil fired turbine	yes	SO_2 - 24 hr. - 90%	VALLEY	yes	no	0	Original modeling showed increment violations. Solution was to obtain offsets resulting in a net air quality improvement.
Alaska Petro-Chemical	10	New petroleum refinery	yes	SO_2 - 24 hr. - 91% SO_2 - 3 hr. - 98%	VALLEY, MERSVAL	yes	yes	PM - 64 SO_2 - 3,120	Original modeling showed increment violations. Tighter emission controls (FGD system) caused reduction in increment consumption.

N/A = Not subject to a NSPS.

To demonstrate compliance with the allowable PSD increments, 11 of these 13 sources made project alterations, such as increased stack heights, additional emission controls, etc. For the two remaining sources where original increment violations were predicted, refined modeling analyses were performed to demonstrate that the levels of increment consumption originally predicted by using screening analyses were overstated.

6.4 ANALYSIS OF NATIONAL AMBIENT AIR QUALITY STANDARDS IMPACTS

A prerequisite to receiving a PSD permit is the demonstration that the proposed project will not cause or contribute to a violation of a NAAQS, considering the air quality existing at the time of PSD application submittal. This demonstration usually involves superimposing the projected ambient impacts resulting from the proposed project on the values representative of existing air quality.

NAAQS Impact Analyses

Figures 6-3 through 6-5 show the distributions of projected maximum ambient concentrations of PM, SO_2, and NO_x respectively, for data base A/Q analyses. No analysis was made for CO air quality reviews because in more than 90% of the cases, the ambient impacts projected to result from new CO emissions were "insignificant". The significance levels of increased NAAQS pollutant concentrations below which detailed air quality review is unnecessary are as follows:

	Averaging Time				
Pollutant	1-hour	3-hour	8-hour	24-hour	Annual
PM	-	-	-	5 ug/m^3	1 ug/m^3
SO_2	-	25 ug/m^3	-	5 ug/m^3	1 ug/m^3
NO_x	-	-	-	-	1 ug/m^3
CO	2000 ug/m^3	-	500 ug/m^3	-	-

In most cases where "insignificant" ambient impacts were predicted, the PSD applicant need only demonstrate that the area of his source is "attaining" the respective NAAQS. Usually, a detailed A/Q analysis was not required. In viewing Figures 6-3 to 6-5, it must be remembered that the cases of "insignificant" impact refer only to the increase in ambient concentration expected with the project proposed in the PSD application and describes nothing about the ambient pollutant concentrations in the vicinity of the source.

FIGURE 6-3. DISTRIBUTION OF PROJECTED MAXIMUM AMBIENT PM CONCENTRATIONS FOR ALL DATA BASE PM AIR QUALITY REVIEWS.

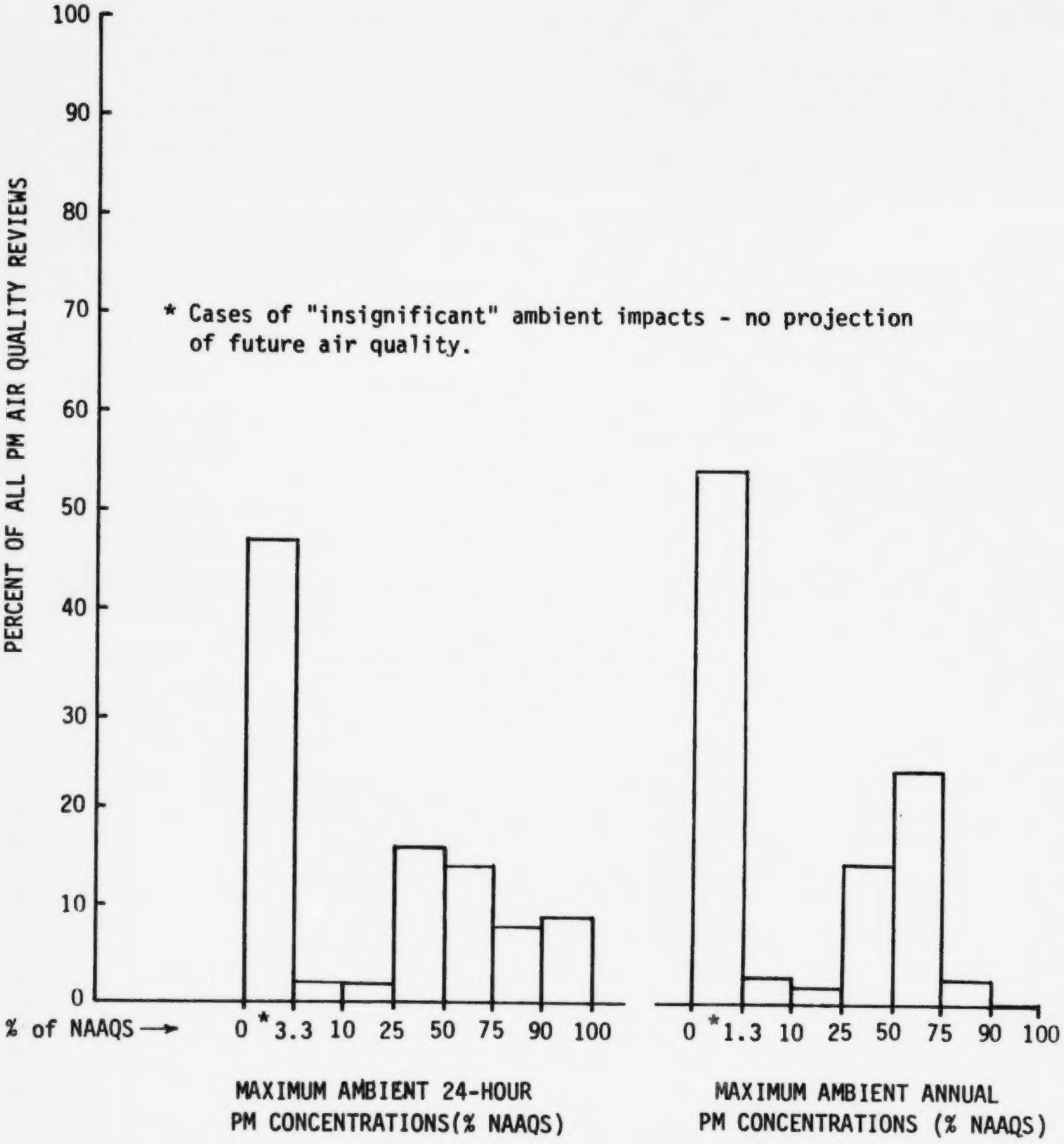
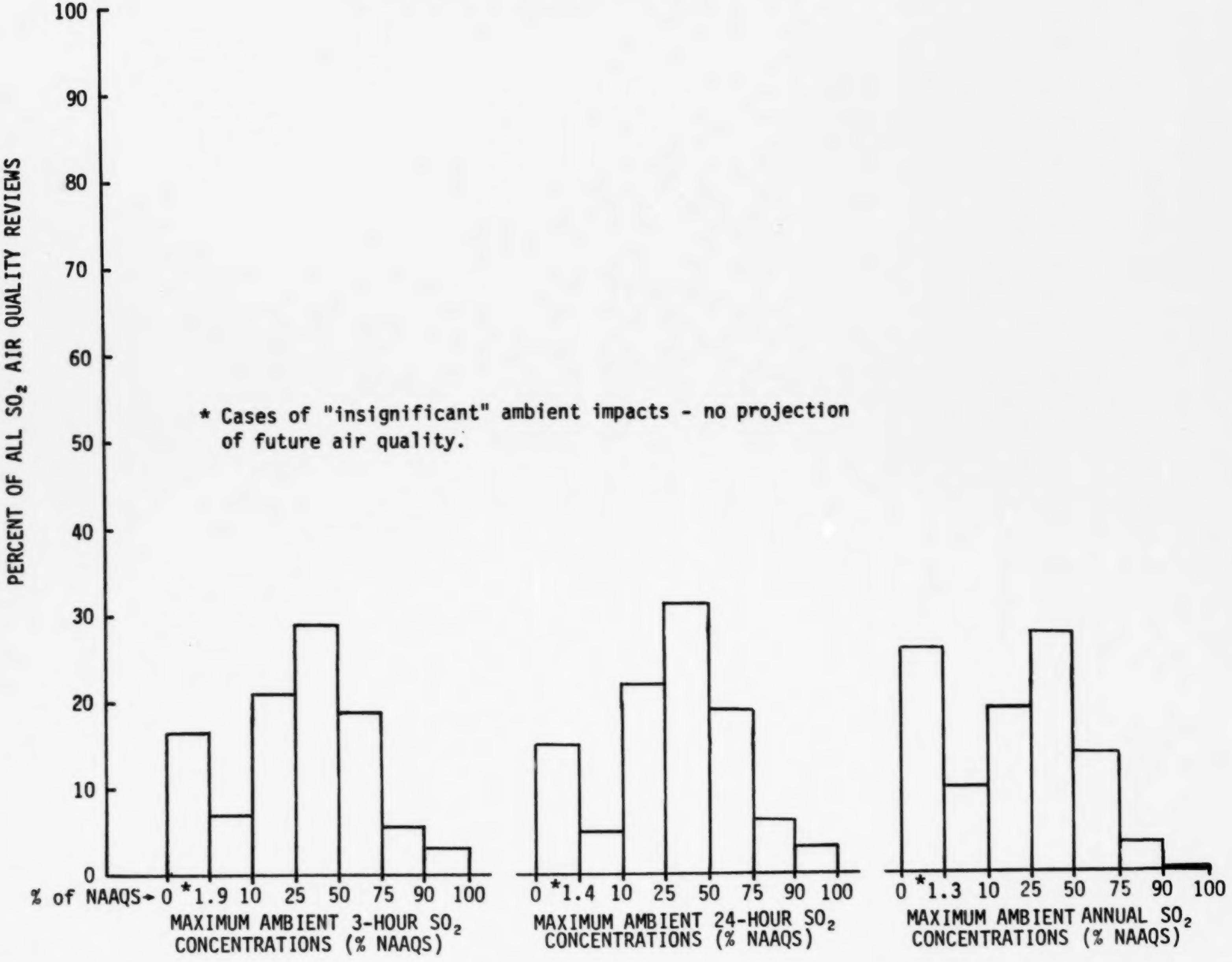
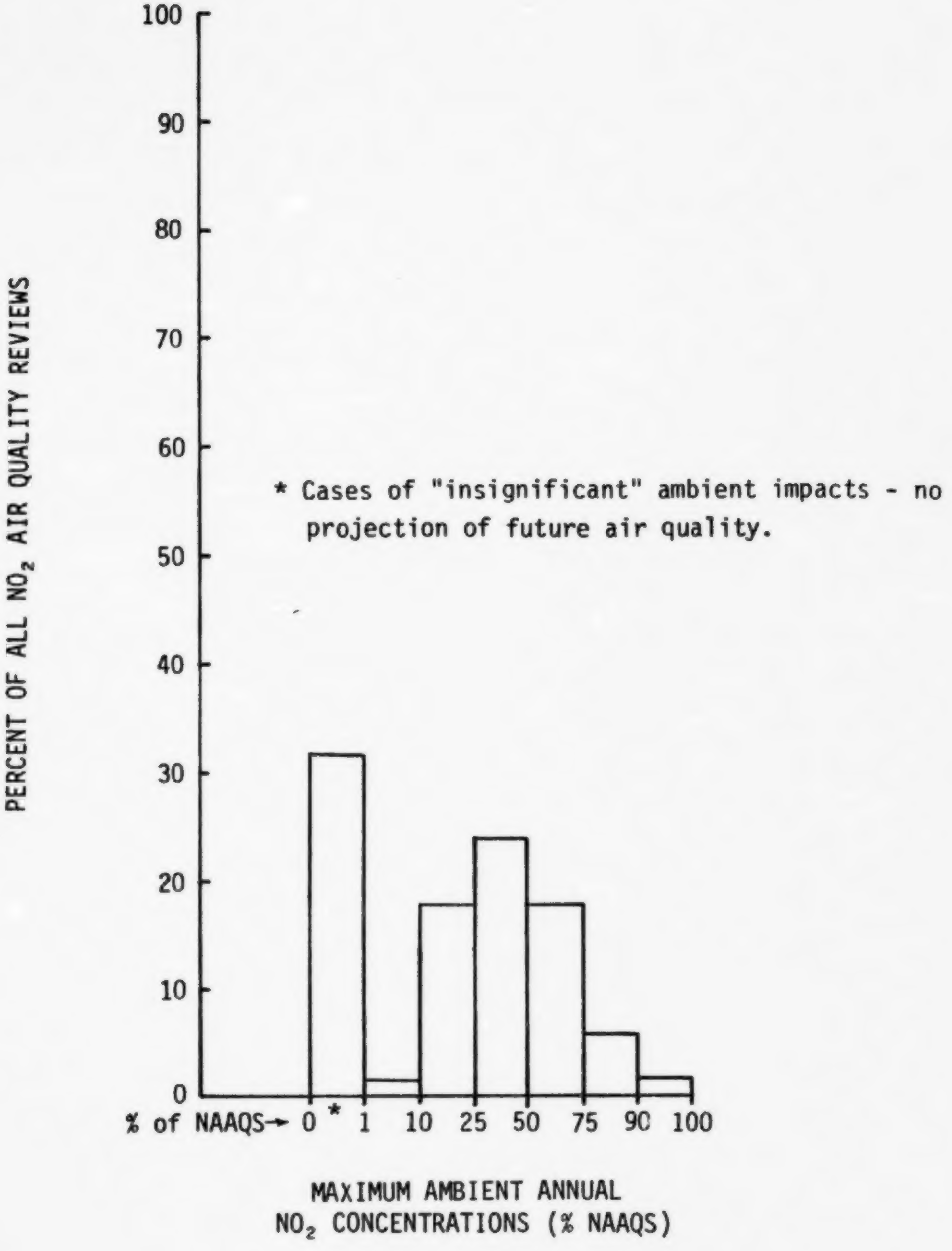


FIGURE 6-4. DISTRIBUTION OF PROJECTED MAXIMUM AMBIENT SO_2 CONCENTRATIONS FOR ALL DATA BASE SO_2 AIR QUALITY REVIEWS.



* Cases of "insignificant" ambient impacts - no projection of future air quality.

FIGURE 6-5. DISTRIBUTION OF PROJECTED MAXIMUM AMBIENT NO_2 CONCENTRATIONS FOR ALL DATA BASE NO_2 AIR QUALITY REVIEWS.



* Cases of "insignificant" ambient impacts - no projection of future air quality.

As shown in Figure 6-3, insignificant impacts were predicted in over 50% of the PM A/Q analyses. Considering the degrees of available PM emissions control, it is not unusual that numerous insignificant ambient PM impacts were predicted. In fact, a 500 MWe utility boiler with allowable PM emissions of .03 lbs/M^2 Btu (NSPS) will generally show insignificant PM impacts. However, because of the generally high ambient background level of PM (dust, etc.), almost 30% of the PM A/Q reviews predict ambient concentrations greater than 50% of the PM NAAQS.

Similarly, Figure 6-4 shows that about 30% of the 3-hour SO_2 concentrations but only about 20% of the 24-hour and annual SO_2 A/Q reviews predict concentrations greater than 50% of the respective NAAQS. Note that for each time averaging period in Figure 6-4 that less than 30% of the SO_2 A/Q reviews predicted ambient SO_2 concentrations greater than 90% of the NAAQS. In Figure 6-5, a similar trend is shown for NO_2. (Note: Similar analyses were not performed for VOC impacts on ambient ozone concentrations because acceptable predictive models for VOC impacts are not available.)

In summary, based on Figures 6-3, 6-4 and 6-5, it does not appear that ambient concentrations approaching the NAAQS ceilings were frequently a factor or limiting characteristic in processing PSD applications for the data base cases.

Effects of Constraints Caused by National Ambient Air Quality Standards (NAAQS)

Although the NAAQS did not appear to have had much effect on many PSD projects but in those cases where they did, the most limiting was the 24-hour allowable ambient TSP concentration of 150 ug/m^3. As shown below, this occurred in 9% of the cases involving air quality reviews.

	NAAQS Pollutant/Averaging Period							
	TSP		SO_2			NO_x	CO	
	24-hr	Annual	3-hr	24-hr	Annual	Annual	1-hr	8-hr
% of A/Q Analyses Where More Than 90% NAAQS Impacted	9%	0%	3%	3%	0%	2%	0%	0%
% of A/Q Analyses That Showed Insignificant Impacts	47%	54%	17%	15%	27%	32%	94%	90%

6.5 CLASS I AREA IMPACTS ANALYSES

Analyses for Class I area impacts generally consist of:

1. Demonstration of compliance with allowable Class I area increments;
2. Estimation of visibility impacts on Class I areas; and
3. Impacts on soils and vegetation in Class I areas.

However, these analyses are generally not required where the source is (or will be) located more than 100 km from the nearest Class I area. Even at 50-100 km distant, dispersion modeling accuracy decreases rapidly, especially in complex terrain where many of the Class I areas are located.

There are 59 data base PSD applications for sources located within 100 km of a Class I area. In four (4) cases permit processing delays occurred because of concerns over Class I area increment impacts. Although these cases predicted Class I increment impacts, they were ultimately issued PSD permits. Three of these cases indicated Class I increments would be more than 50% consumed and in one case, 100% of the Class I TSP increment was shown to be consumed. This source, a brewery, ultimately reduced the size of the proposed plant by 50%. In another case, a large utility, the final plant site location was moved a greater distance away from a Class I area than that originally chosen. Based on this information, it appears that Class I increments played a major role in the projects involved in two data base permits.

Additionally, no analysis were performed to identify those PSD applications which have not yet been issued PSD permits as a result of Class I area concerns.

6.6 EFFECT OF A/Q CONSTRAINTS ON EMISSIONS REDUCTIONS BEYOND NSPS

A rough screening analysis was performed in order to determine reasons for emissions reductions beyond NSPS. This analysis assumed all plant, process and dispersion (fuel type, control technology, etc.) parameters to be the same as those specified in the respective PSD permits. Forty-two data base sources (85 technology reviews) received PM and/or SO_2 emissions limitations more stringent than an applicable NSPS. Air quality analyses of these sources were evaluated to determine the role that air quality compliance demonstrations played in establishing the emissions limitations of these PSD permits. The quantity of PM and SO_2 emissions reductions beyond NSPS were distributed among four categories:

1. As a result of TSP or SO_2 NAAQS constraints;
2. As a result of increment constraints;
3. As a result of case-by-case BACT; and
4. Cause unknown.

Table 6-7 summarizes that distribution. As shown, it appears that the majority of SO_2 emissions reductions beyond NSPS resulted from increment contraints. Particulate matter emissions reductions beyond NSPS were difficult to categorize.

Table 6-7. EMISSION REDUCTIONS BEYOND NSPS AND PARTIAL CONTRIBUTIONS BY PROBABLE CAUSE OF THOSE REDUCTIONS (tons/year)

	As a Result of NAAQS Constraints	As a Result of Increment Constraints	As a Result of Case-by-Case BACT	Unable to Determine Cause*	Total Emission Reductions Beyond NSPS	Total Permitted Emissions for Sources Subject to NSPS
SO_2	36,100	115,500	56,600	10,500	218,700	603,400
PM	0	200	2,300	5,200	7,700	35,200

*Insufficient data to categorize emission reductions.

7.0 MISCELLANEOUS ASSOCIATED ANALYSES

7.1 EFFECTS OF CLASS I SO_2 INCREMENT ON POWER PLANT SITING

Introduction

A major concern to proposed new coal-fired power plant construction in the western U. S. is the Class I SO_2 increment. Many existing and proposed power plants are situated in complex terrain areas within 100 kilometers of a Class I area. In some instances, the boiler stack height is lower than the surrounding terrain elevations resulting in significant downwind air quality impact.

The following analysis investigates the air quality impact on allowable SO_2 increment resulting solely from a large (640 MWe) coal-fired power boiler with various SO_2 emission rates located in both flat and complex terrain. Air quality dispersion models were used to determine adequate distances between the power plant and the Class I area to avoid exceedences of the Class I SO_2 increments.

Results

The flat terrain analysis for the three power plants has been summarized in Table 7-1. The short-term results in this table are based on the "highest" predicted SO_2 concentrations. This is because only one year (instead of five years) of meteorological data was used in the analysis which according to the EPA policy, requires use of highest short-term results for regulatory purposes. Notice that power plant #1 (1.2 lb/MMBtu) could not be located closer than 100 kilometers without exceeding the 24-hour SO_2 Class I increment and 20 kilometers without exceeding the annual increment. Power plants #2 and #3 (0.6 lb/MMBtu and 0.3 lb/MMBtu, respectively) did not violate the Class I increment beyond 42 and 19 kilometers, respectively on a 24-hour average, and both plants would violate the annual Class I increment, regardless of distance. Table 7-2 shows the relationship between SO_2 concentrations and distance from each

Table 7-1.
CRSTER RESULTS FOR FLAT TERRAIN ANALYSIS

Averaging Period	SO_2 Class I Increment (ug/m^3)	Distance of Source from Class I Area Beyond Which SO_2 Increment is Not Exceeded* (km) Plant #1	Plant #2	Plant #3
24-hour	5	100	42	19
Annual	2	20	0	0

*SO_2 emissions from plant:

#1 = 1.2 lb/MMBtu
#2 = 0.6 lb/MMBtu
#3 = 0.3 lb/MMBtu

Table 7-2.

SULFUR DIOXIDE IMPACTS OF VARIOUS DISTANCES FROM PLANTS 1, 2 and 3 IN FLAT TERRAIN

		SO_2 Impacts (ug/m^3)					
		Plant #1		Plant #2		Plant #3	
Averaging Period	Distance from plant (km)	Highest	Second highest	Highest	Second highest	Highest	Second highest
24-hour	10	26.0	17.4	10.5	8.4	6.6	4.3
	25	18.0	12.3	7.7	5.9	3.9	3.0
	50	8.7	8.4	4.3	4.1	2.3	2.2
	75	6.3	5.8	3.1	2.8	1.6	1.5
	100	5.0	4.2	2.4	2.0	1.2	1.0
Annual	10	2.3	–	1.2	–	0.6	–
	25	1.9	–	0.9	–	0.4	–
	50	1.3	–	0.6	–	0.3	–
	75	1.0	–	0.4	–	0.2	–
	100	0.8	–	0.3	–	0.1	–

SO_2 emissions from plant:

#1 = 1.2 lb/MMBtu
#2 = 0.6 lb/MMBtu
#3 = 0.3 lb/MMBtu

of the coal fired boilers. Concentrations shown for power plant #3 were computed by ratioing the SO_2 concentrations between power plant #1 and #3 which had identical stack parameters. Stack and emission parameters are shown in Table 7-3. The 3-hr allowable Class I increment was not analyzed because it was felt that this standard is less restrictive than the 24-hr increment.

Complex terrain modeling results are summarized in Table 7-4. Note that all three of the power plants studied were able to meet the annual SO_2 Class I increment within a 100 kilometer radius of each source. However, all three plants exceeded the 24-hour SO_2 Class I increment of 5 ug/m^3 as far as 100 kilometers distant. Maximum concentrations were located at terrain elevations equal to the final plume centerline.

Analyses Approach

Three separate coal-fired steam electric generators, each having a 640 MWe (6800 MMBtu/hr) heat input, analyzed with a screening dispersion modeling approach. The emission rate for each of these units was based on the percentage of sulfur in the coal and the efficiency of control for SO_2. Table 7-3 summarizes the stack and emissions parameters for all three units.

The single source air quality dispersion model, CRSTER, was used to model SO_2 concentrations from the three coal-fired units listed in Table 7-3, with emission rates of 1.2 lb/MMBtu, 0.6 lb/MMBtu, and 0.3 lb/MMBtu, respectively. All three units were modeled in separate computer analyses. The terrain was modeled as a flat plane, typical of the topography east of the Rocky Mountain range. Surface observations and rural mixing heights from Denver, Colorado for the year 1964 were the meteorological inputs to the dispersion model.

The complex terrain analysis made use of the VALLEY air quality dispersion model. All three coal-fired units were modeled in separate computer analyses. Meteorological input data was taken from Grand Junction, Colorado for the years 1960 through 1964. The plant elevation was set equal to that of Grand Junction (an average of 4596 feet above mean sea level). The elevated terrain surrounding the power plant had an elevation equal to the centerline height of the buoyant plume above mean sea level as calculated using the PTMAX dispersion model. These

Table 7-3.

STACK AND EMISSIONS PARAMETERS

FOR THREE 640 MW COAL-FIRED POWER BOILERS

Plant ID	SO_2 Emissions		Percent Control Efficiency	Stack Height (m)	Exit Temperature (K)	Exit Velocity (m/sec)	Stack Diameter (m)
	g/sec.	#/MMBtu					
#1	1028	1.2	90	150	335	24.1	7.01
#2	514	0.6	70	150	340	24.1	7.01
#3	257	0.3	90	150	335	24.1	7.01

Table 7-4.

VALLEY RESULTS FOR COMPLEX TERRAIN ANALYSIS

Averaging Period	SO_2 Class I Increment (ug/m^3)	*Distance of Source from Class I Area Beyond Which SO_2 Increment is Not Exceeded		
		Plant #1	Plant #2	Plant #3
24-hour	5	>100**	>100	>100
Annual	2	91	48	26

*SO_2 emissions from plant.

#1 = 1.2 lb/MMBtu
#2 = 0.6 lb/MMBtu
#3 = 0.3 lb/MMBtu

**Receptor elevation for plant #1 and plant #3 = 5481 ft.
Receptor elevation for plant #2 = 5494 ft.
Average plant elevation = 4596 ft.

elevations varied with the stack parameters, atmospheric stability and wind speed. Maximum 24-hour SO_2 concentrations were calculated using F stability and a 2.5 meters per second wind speed. For the reason previously mentioned, maximum 3-hour SO_2 concentrations from the power plants were not analyzed. The annual SO_2 concentrations were calculated using the joint frequency distribution from five years of the Grand Junction meteorology. Surrounding terrain elevation was set at the buoyant plume centerline height based on different stack and meteorological parameters to insure that receptors would be located at the elevation of maximum concentration.

Both the flat and complex terrain analyses assumed rural meteorological conditions. All parameters were assumed to remain constant with time. No building wake effect or stack-tip downwash was considered in the analyses. All units modeled were assumed to meet Good Engineering Practice (GEP) stack height in all of the modeling runs. Additionally, the minor effect of SO_2 decay on related concentrations was not considered. All stacks were modeled at 100 percent load, the maximum emission rate.

The flat terrain analysis incorporated two additional assumptions. The meteorological data input to the CRSTER model observed at Denver, Colorado was assumed to be typical of conditions observed in the plains of the western U. S. Secondly, the elevation of the Class I areas downwind of the power plant was assumed equal to the plant elevation.

Meteorological data from Grand Junction, Colorado was determined appropriate for the calculation of annual SO_2 concentrations present in complex terrain because the area's immediate topography consists of mountains, elevated plateaus, and deep canyons. Maximum air quality impact was calculated by setting the Class I area elevation equal to the annual average plume centerline height. The plume rise calculations for F stability and a 2.5 m/s wind speed determined the elevation of the Class I area receptors for the computation of the maximum annual SO_2 concentrations. It was also assumed that the maximum SO_2 24-hour concentration will occur during constant conditions of F stability and winds of 2.5 m/s (the standard EPA screening technique).

7.2 EFFECT OF ALTERNATIVE CLASS I INCREMENT SYSTEM ON EMISSIONS NEAR CLASS I AREAS

In its recommendations, the National Commission on Air Quality proposed air alternative increment systems for Class I areas. The proposal would eliminate shortterm increment tracking in Class I areas but will maintain the requirement for annual increment tracking in these areas. However, the applicant would be required to demonstrate that the proposed source itself did not violate the short-term increment.

No comprehensive studies of the air quality impacts of this proposal on a national basis can be performed. Therefore, in order to approximate the range of conditions that may be encountered in practice, this response evaluates three types of cases:

1. Remote areas - little or no industrial development. A single source dominates the short-term air quality impacts in the Class I area;
2. Areas of moderate industrial development - two or more sources, closely spaced, dominate the short-term air quality impacts in the Class I area; and
3. Areas of heavy industrial development - numerous sources dominate the short-term air quality impact in the Class I area.

For case 1, no detailed analysis is required because the source would already have the entire short-term increment available to itself. For case 2, a simulation was performed to estimate the effects of power plants (each 640 MWe generating capacity) on a Class I area. The analysis for case 3 is based on an actual situation in the Theodore Roosevelt National Park in North Dakota.

The following table summarizes the estimated emissions changes and air quality impacts in the Class I area for the cases studied. For each case, the estimated emissions and air quality changes are represented by ranges. This is because, in each case, there are two possible situations where the proposal will have no effect. This occurs when the single source already dominates the multi-source, short-term increment consumption or when the multi-source annual increment consumption is the emissions limiting factor.

ESTIMATED EFFECTS OF ELIMINATING SHORT-TERM INCREMENT TRACKING

Case	Emissions Change	Air Quality* Impact	Reduction in Required Air Quality Modeling
1	None	None	None
2	0-250% Incr.	24-hr: 0-13 ug/m^3 Incr. annual: 0-1.4 ug/m^3 Incr.	Moderate
3	0-67% Incr.	24-hr: 0-3.6 ug/m^3 Incr. annual: 0-.7 ug/m^3 Incr.	Substantial

*Based on SO_2 emissions

Discussion:

Case 1

The proposal has no effect on air quality in Case 1. Where only one source causes ambient PM or SO_2 impacts in a Class I area, that source already has the full short-term as well as the annual increment available to itself. Moreover, even where several sources are in the vicinity of a Class I area, but are spaced such that no two sources will have simultaneous impact in the Class I area for any 3-hour or 24-hour period, the effects of the proposal are negligible. For example, if four sources are located 90° radially from the Class I area (i.e. due North, due South, etc.) the maximum short-term increment impact in the Class I area will probably occur when the winds remain persistent from the direction of one of the sources. In this case, the three other sources will probably not impact the Class I area on a 3- or 24-hour basis. However, all four sources will probably have annual impacts in the Class I area. In this case, the emissions limiting air quality factors will be the annual increment, the short-term increment consumption of the single source, or a National Ambient Air Quality Standard.

Case 2

The moderately developed case is the most likely to be impacted by the proposal. This situation differs from the remote (Case 1) areas in that emissions growth is concentrated in one area rather than being dispersed around the Class I area.

Under existing regulations, emissions growth in this situation is generally limited by the multi-source impact on the short-term increments. (As discussed in the response to part (b) of this question, this multi-source impact tends to be overestimated.) To simulate the effects of the proposal in this case, dispersion modeling of SO_2 emissions from electric utility generating stations in flat terrain was conducted. The plants are assumed to each have a 640 MWe generating capacity and use scrubbers for SO_2 emissions. Assuming all sources were co-located at distances of 20 kilometers and 75 kilometers from a Class I area, the amount of additional SO_2 emissions and their impact in the Class I area that would be made possible by the proposal were determined. Then the number of these sources that could locate in the area was determined for the "current" and "proposed" increment systems. The assumption of co-located sources simply represents "pockets" of SO_2 emissions increases. It was assumed that each source is required to reduce SO_2 emissions by 90% to a level of 0.3 lbs/MMBtu. The results are tabulated below.

EFFECT OF PROPOSAL IN CLASS I AREA OF MODERATE INDUSTRIAL ACTIVITY (CASE 2)

	CURRENT SYSTEM			PROPOSED SYSTEM			AIR QUALITY IMPACT	
DISTANCE FROM CLASS I AREA km	SO_2 Emissions Allowable T/yr	Maximum 24-hr Impact ug/m^3	Maximum Annual Impact ug/m^3	SO_2 Emissions Allowable T/yr	Maximum 24-hr Impact ug/m^3	Maximum Annual Impact ug/m^3	Change in 24-hr Impact ug/m^3	Change in Annual Impact ug/m^3
20	10,000	5.0	0.6	35,000	18.0	2.0	+13.0	+1.4
75	28,000	5.0	0.75	75,000	13.4	2.0	+8.4	+1.25

Assuming each source continuously emits SO_2 at the allowable rate, each 650 MWe plant discharges 8,500 tons/yr SO_2. To avoid a short-term increment violation, the current system allows a maximum of 10,000 tons/yr SO_2 at 20 km, slightly more than the emissions from one plant. If, however, the sources were allowed to emit SO_2 at a rate of 0.6 lbs/MMBtu, neither the current nor proposed system would allow one such source at that distance.

This is because such a plant would emit 17,000 tons/yr SO_2, far greater than the amount that would be allowed at that distance.

The following table indicates the number of 640 MWe utility sources permitted at two different emission rates that could co-locate at 20 and 75 km from the nearest Class I area under both the current and proposed systems.

POTENTIAL MAXIMUM NUMBER OF 650 MWe UTILITY SOURCES

	Permitted at 0.3 lbs/MMBtu		Permitted at 0.6 lbs/MMBtu	
Distance to Nearest Class I Area (km)	Under Current System	Under Proposed System	Under Current System	Under Proposed System
20	1	4	0	0
75	3	8	1	4

The above results assume neither Class II increments nor any NAAQS is threatened. As can be seen, under the current increment system, only one source could locate in that area without violating the 24-hr Class I increment. Under the proposed increment system, four sources permitted at 0.3 lb/MMBtu SO_2 could locate in the same area at 20 kilometers from the Class I area, each consuming 4.5 ug/m^3 and 0.5 ug/m^3 of the 24-hour and annual increments respectively. This results in total 24-hour and annual impact of 18 ug/m^3 and 2 ug/m^3. It must be noted that each of these same four sources could probably locate within 20 kilometers of the Class I area under the current system if each were located apart from each other (e.g., radially spaced at 90^0 intervals).

If these sources were permitted at 0.6 lbs/MMBtu SO_2, the current or proposed system would not allow even one source to locate at 20 km. The short-term impact of the source's SO_2 emissions (17,000 tons/yr) would be about 9 ug/m^3, a violation of the limit of 5. Such a source would have to locate at least 42 km from the nearest Class I area under either system.

This analysis is assumed to be conservative because of the assumptions made. Furthermore, this analysis is applicable, although more conservative, for complex terrain areas. In these cases, the single source influences maximum short-term impacts to a greater degree and therefore, would be more likely to be limited by the 24-hour increment.

Case 3

The proposed increment system was evaluated for areas of heavy industrial activity (Case 3) by extracting data from an EPA report entitled: Evaluation of Alternative Prevention of Significant Deterioration Policies: A Case Study of Energy Development in Western North Dakota. The study considered SO_2 sources within 100 miles of Theodore Roosevelt National Park. Seven increment consuming sources (4 utilities, 2 gas processing plants and 1 gasification plant) had already received PSD permits when applications for five additional sources were submitted (3 utilities, 1 gas processing plant and 1 gasification plant).

The previously permitted seven sources emit 118,000 tons per year SO_2 emissions; the five pending PSD applications request that an additional 68,000 tons per year SO_2 be allowed in the area.

Based on the current procedures, only two of the five PSD applications could be approved without violating the 24-hour SO_2 Class I increment. One utility, one gas processing plant and one gasification plant could not receive PSD permits because of the emissions limiting constraint of the short term increment.

Under the proposed increment consumption approach, the three "unpermittable" sources could be approved with neither violation of the annual increment by all sources nor violation of the short term increment by any one source. Furthermore, in addition to the SO_2 emissions from these three sources, the report indicates that 54,000 tons per year more SO_2 emissions could be permitted under the proposal without any Class I increment violation. For the purpose of the table below, these additional SO_2 emissions were converted into the equivalent emissions from five sources consisting of two utilities, two gas processing floats and one gasification plant.

The results of this analysis are summarized below:

EFFECT OF PROPOSAL IN CLASS I AREAS OF HEAVY INDUSTRIAL ACTIVITY (CASE 3)

			SO_2 Increment Consumption (ug/m^3)	
	SO_2 Emissions	No. of Sources	24-Hour	Annual
"Permittable" under current increment system	144,000	9 (7 existing + 2 of 5 proposed)	4.9	1.3
Proposed sources "not permittable" under current system	43,000	3	1.3	0.3
"Permittable" under proposed increment system	241,000	17 (12 existing or proposed + 5 others)	8.5	2.0
Net change caused by proposed system	+97,000 (67%)	+8 (89%)	+3.6 (75%)	+0.7 (52%)

As can be seen, permitting the three "unpermittable" sources will result in a 24-hour SO_2 concentration in the Class I area of 6.2 ug/m^3, 1.2 ug/m^3 over the current limit. As in the previous example (Case 2), it must be pointed out that source location is critical to this kind of analysis. Under the current system, the same amount of SO_2 emissions probably could have been permitted if the source located in a manner that would preclude any presumption of plume interaction.

The burden of annual increment compliance demonstration is far less than that of the short-term increment because of the fewer meteorological scenarios required to be examined. The burden on PSD applicants for short-term increment compliance demonstration is directly related to the number of sources modeled. Therefore, the beneficial effects of the proposed increment system in terms of reduced dispersion modeling requirements increase according to the number of sources in the area.

7.3 TIME AND COSTS TO PREPARE A PSD APPLICATION

From a sample of ten representative PSD permits selected for study, the approximate number of work years to develop PSD applications ranged from 0.08 (160 man-hours) to 4.4 (8,800 man-hours) as is shown in Table 7-5. The associated costs ranged from $5,000 to $1,020,000.

The most costly and time consuming portion of PSD application preparation is pre-construction ambient monitoring required to develop background levels for various pollutants, where continuous ambient monitoring by the source was required. The two most costly projects in the sample involved new source construction of electrical utilities, both of which were subject to the 1980 PSD regulations. In these cases, ambient pollutant and meteorological monitoring requirements contributed an average of 75% to the total cost of the application. Approximately 40% of these monitoring costs were due to the cost of the actual equipment, with the other 60% due to labor costs. The second most costly portion of PSD application preparation is modeling for ambient impact analyses. In the sample, the work years attributable to modeling ranged from 0.04 (80 man-hours) to 1.86 (3,720 man-hours) and costs from $3,400 to $140,000. The applicants that were surveyed agreed that monitoring costs, where monitoring was required, and not modeling costs were the determining factor in the total cost of the applications.

In the sample, the associated BACT analyses work years and costs ranged from 0.013 (26 man-hours) to 0.14 (280 man-hours), and from $1,000 to $39,600, respectively. The $1,000 cost involved only one pollutant, while the higher range cost involved determinations for four pollutants. Generally, the cost of BACT analyses ranged from approximately $3,000 to $4,000 when less than four pollutants were subject to PSD requirements. Based on Table 7-5, in cases where neither extensive ambient monitoring nor air quality analyses are required, it is probably fair to estimate an average PSD application cost between $10,000 and $50,000.

Table 7-5. CASE STUDY OF WORK YEARS AND COST TO PREPARE PSD APPLICATIONS

Source Type	State Where Source is Located	New Source	Modification Type Unit	No. of Pollutants Subject to PSD	Source or Contractor Prepared Application	NAAQS Threatened by Proposed Construction	No. or Models Used in Impact Analysis	No. of Sources Considered in Modeling Analysis	Modeling Costs Higher Due to Modeling More Than Once	Work Years Required for Impact Analysis	Cost of Impact Analysis ($)	Work Years Required for BACT Analysis	Cost of BACT Analysis ($)	Source Required to Conduct Pre-construction Monitoring	Pollutant(s) Monitored by Source	Ambient Monitoring Provided by State Agency	Work Years Required for Air Quality Monitoring Analysis	Cost of Air Quality Monitoring Analysis ($)	Total Work Years Required to Prepare PSD Application	Total Cost of Prepare PSD Application ($)
Chemical Processing	NJ	No	Combustion	3	Source	Yes	2	8	No	0.2	12,800	0.04	2,560	No	NA	Yes	negligible	640	0.25	16,000
Electric Utility	NY	Yes	NA	4	Source	No	2	14	No	1.005	80,400	0.5	39,600	Yes	TSP, SO_2[a]	No	1.8	900,000	3.0	1,020,000
Steel Mill	VA	No	Process	1	Source	No	1	5	No	0.042	3,360	0.013	1,000	No	NA	Yes	negligible	640	0.1	5,000[d]
Electric Utility	FL	Yes	NA	4	Contractor	Yes	4	5	No	1.86	139,530	0.14	10,462	Yes	TSP, SO_2, NO_x, CO, O_3	No	2.4	280,000	4.4	430,000
Fiberglass Mfg.	IN	No	Process	1	Contractor	Yes	3	1	Yes	0.2	16,000	0.04	3,200	No	NA	Yes	negligible	600	0.25	19,800
Coal Preparation	OH	No	Process	1	Contractor	No	1	1	Yes	0.2	23,000[e]	Data not Available	Data not Available	No	NA	Yes	negligible	2,000	0.25	25,000
Chemical Processing	LA	No	Combustion	2	Contractor	No	3	21	No	0.12	10,000	0.045	3,000	No	NA	Yes	0.0[b]	0[b]	0.2	13,000
Portland Cement	TX	No	Fuel Switch	3	Contractor	No	3	20	No	0.09	7,200	0.015	1,200	No	NA	Yes	negligible	40	0.1	8,440
Compressor Station	KS	No	Combustion	1	Source	No	1	1	No	0.04	4,500	0.04	2,300	No	NA	Yes	0.0[b]	0[b]	0.2	6,800
Electric Utility	IN	No	Combustion	2	Source	No	1	11	No	0.25	20,000	0.05	4,000	Yes	TSP, CO	No	0.325	26,000[c]	0.6	50,000

[a] Three SO_2 continuous analyzers were required.

[b] Air Quality Analysis was not required because of rural location of source. 20 $\mu g/m^3$ was assumed for background ambient concentration.

[c] Equipment costs were not included because source already owned monitoring equipment.

[d] EPA conducted portions of the analyses in this case.

[e] Survey indicated source chose to change stack height configuration, which required modeling to be redone 3 times. This was not required by EPA.

APPENDIX A. DISCUSSION OF MAJOR CHANGES IN APPLICABILITY OF PSD AND NON-ATTAINMENT REGULATIONS AND THE EFFECT ON PERMITS IN THE DATA BASE

This appendix contains a very general discussion of the applicability requirements of the 1978 and 1980 regulations. In certain cases, however, exemptions may apply which render the following discussion incomplete. However, the statements below apply to a large majority of permits issued under the PSD program. The reader is referred to the Federal Register notices listed in Table A-1 for a complete discussion of PSD and non-attainment applicability.

The most significant differences between the 1978 and 1980 PSD regulations with respect to PSD applicability are found in the definitions of potential to emit (PE) and major modification. Table A-1 summarizes the key changes to these and three other related definitions. Table A-2 gives a list of the recent PSD and nonattainment regulations history with the key actions taken on the specified date.

The definition of PE was changed with the 1980 regulations to include emissions after application of pollution controls whereas the 1978 regulations did not consider pollution controls for PE determinations. The effect of this change was to reduce the number of major sources subject to PSD. For example, a new source with one emissions unit is anticipated to emit particulate matter (PM) at 10 tons/year after being controlled by a 99 percent efficient control device. It would emit 1000 tons/year in the absence of such control. This source would be a major source (PE = 1000 tons/year before control) under the 1978 regulations and would undergo PSD review. However, the source would not be major (PE = 10 tons/year after control) under the 1980 regulations and would not undergo PSD review.

Table A-1. KEY GENERALIZED DEFINITIONS WHICH CHANGED BETWEEN 1978 AND 1980 PSD REGULATIONS

1978 Definition	1980 Definition
Source	
An entire plant on adjacent or contiguous properties under common ownership, regardless of the various types of operations which may exist on the property.	Same as in the 1978 regulations except that a source would contain only those pollutant emitting activities belonging to the same two digit SIC code. Thus, one source under the 1978 regultions could be subdivided into multiple sources under the 1980 regulations.
Potential to Emit (PE)	
Based upon the uncontrolled emissions subject to enforceable limits on type or amount of material processed or combusted. Fugitive emissions were considered for PE accounting.	Based upon the controlled emissions subject to any enforceable limit on operations. Fugitive emissions were considered only for certain listed sources with respect to PSD applicability.
Major Source	
Any of 28 named sources with PE of 100 or more tons per year or any source with PE of 100 or more tons per year or any source with PE of 250 or more tons per year (100/250 threshold).	Same as in 1978 regulations. Note that the change in definitions of source and PE had impact upon the classification of a source as major.

Table A-1. Continued

1978 Definition	1980 Definition
Major Modification	
Any source which would increase its PE or would have accumulated increases of its PE exceeding 100/250 tons/year, excluding any decreases in PE.	Any significant net emissions increase at a major source or any modification which itself would increase emissions by 100/250 tons per year. This definition considered emissions changes at existing units based upon actual rather than potential emissions.
Increment Consumption	
Based on allowable emissions changes at sources and modifications.	Based upon actual emissions changes at sources and modifications.

Table A-2. BRIEF HISTORY OF NSR REGULATIONS

Federal Register Reference	Date	Action	Significant Requirements/Impacts
41FR55544	December 21, 1976	1. First Emission Offset Interpretive Ruling	Emission offsets and LAER required in or near non-attainment areas
43FR26388	June 19, 1978	2. PSD Regulations Pursuant to the Clean Air Act Amendments, 1977	BACT; NAAQS and PSD increment compliance demonstration; pre- and post-construction monitoring; impact analysis for soils, vegetation, growth, and visibility – all applied in or near attainment or unclassified areas.
44FR3274	January 16, 1979	3. Second Emission Offset Interpretive Ruling	Expansion of sources covered by including those with "potential to emit" based upon uncontrolled emissions; construction moratorium in areas without an approved SIP.
44FR51924	September 5, 1979	4. Proposed Amendments to PSD Regulations and Emission Offset Interpretive Ruling (Pre-Decision, Alabama Power)	Definitions change: "Potential to emit" - include emissions after application of controls; "Major modification" - any significant net emissions increase for designated "major" pollutant, considering concurrent emission changes; "BACT"; "Air quality"; and Monitoring requirements.
45FR7800	February 5, 1980	5. Partial Stay of PSD Regulations (Alabama Power Decision)	PSD review only for sources in attainment or unclassified areas for at least one pollutant; exempt from review sources with uncontrolled emissions greater than the 100/250 threshold but with controlled emissions less than this threshold.
45FR31304	May 13, 1980	6. Partial Stay of Emission Offset Interpretive Ruling	Include "potential to emit" definitions of both Actions 3 and 4, thus fewer sources are subject to ruling.
45FR31304	May 13, 1980	7. Amendment to Emission Offset Interpretive Ruling	Elimination of review for certain sources in attainment and unclassified areas under offset policy.
45FR52676	August 7, 1980	8. Final Amendments for PSD Regulations	Applicability and monitoring requirements changed; "potential to emit" defined for emissions after controls; applicability of BACT; increment consumption, and modification defined in terms of actual emissions; overall effect: decrease in PSD applications but increase in pollutants reviewed per application.
45FR52676	August 7, 1980	9. Amendments to Emissions Offset Interpretive Ruling	"Potential to emit" includes emissions after controls; and other definition changes as in 8.

Acronym Glossary

BACT	Best Available Control Technology
LAER	Lowest Achievable Emissions Reduction
NAAQS	National Ambient Air Quality Standards
PSD	Prevention of Significant Deterioration
SIP	State Implementation Plan

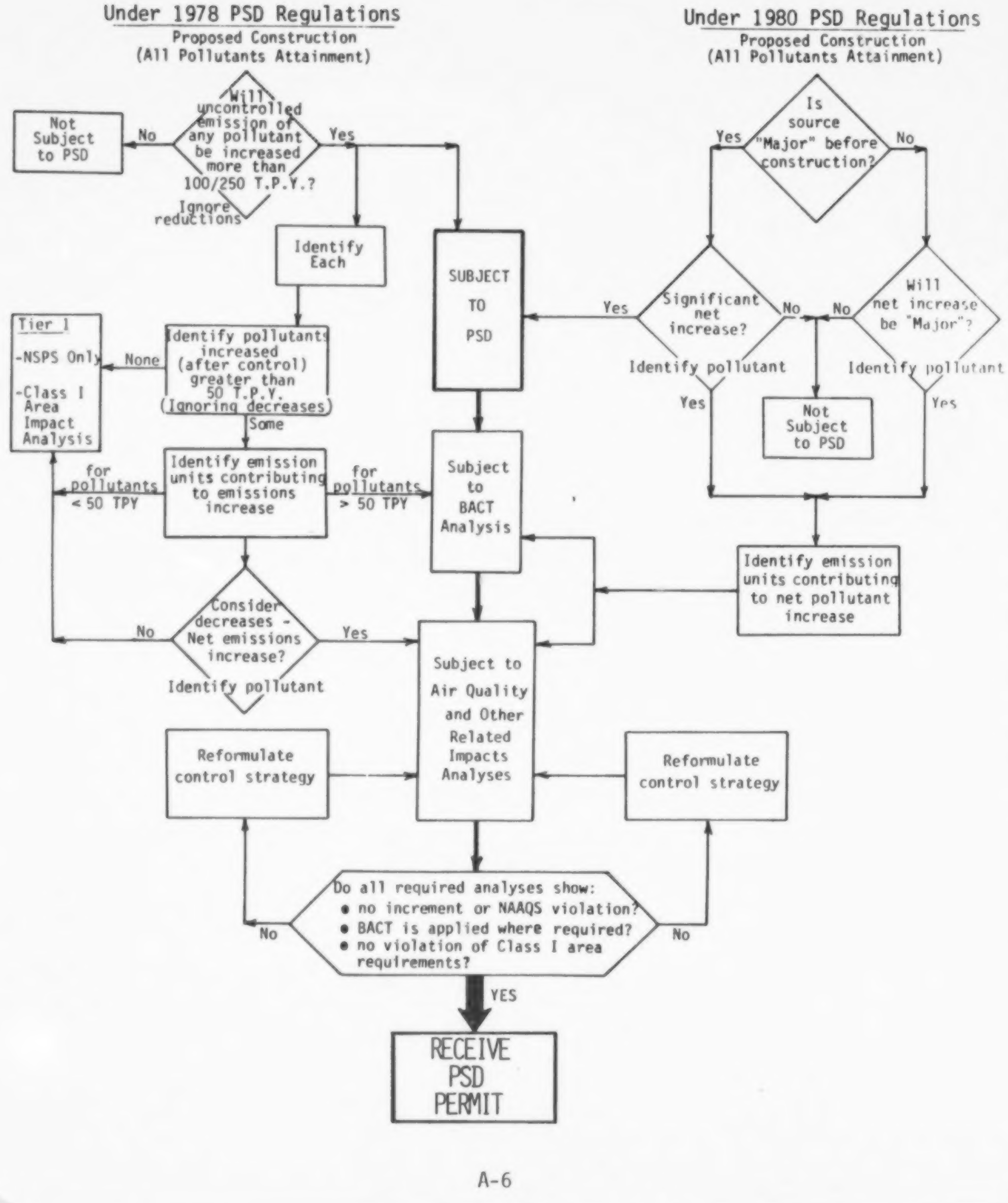
The second major difference between the regulations concerns the definition of major modification. Under the 1978 regulations, a modification was major if uncontrolled PE increased by 100/250 tons/year, not counting decreases in PE. The 1980 regulations considered controlled emissions and actual emissions decreases at the source. Further, the 1980 definitions generally stipulated that a major modification could occur only at an existing major source and that a modification would be subject to PSD for all pollutants with a significant net emissions increase. The effect of this definition change was to increase the number of pollutants requiring review for a given source because the significance levels were set well below the 100/250 ton threshold (for example, sulfur dioxide emissions are significant at levels of 40 or more tons/year).

Figure A-1 gives a generalized flow diagram of the PSD applicability requirements of the 1978 and 1980 regulations. Notice that under the 1980 requirements, applicability is a two-step process: (1) is the source major?; (2) if major, what pollutants will be emitted at significant rates? Each significant pollutant is then subject to review consisting of BACT, air quality, and additional impacts analyses.

A two tier system of review existed under the 1978 regulations. The first tier review was applied to sources with uncontrolled emissions of 100/250 tons/year and controlled emissions of less than 50 tons/year not counting decreases. For such pollutants, a source would be exempt from the BACT, additional impacts, and air quality requirements. The source would be required to meet all NSPS and SIP requirements. The tier 1 review permit was contingent upon a demonstration of no adverse air quality impact and no impact upon Class I areas or known increment violations. This demonstration generally required less complex air quality analysis.

The tier 2 review was required for sources with controlled emissions of 50 or more tons/year not counting decreases. This review consisted of BACT and if there was a net emissions increase, air quality (increments, NAAQS, and perhaps monitoring), and additional impacts (soils, vegetation, visibility, and growth) analyses were required. The source was required to submit dispersion modeling and in many cases, monitoring data to meet the air quality review requirements. A source with a net emissions

FIGURE A-1. GENERALIZED APPLICABILITY FLOW OF 1978 AND 1980 PSD REGULATIONS.


Under 1978 PSD Regulations
Proposed Construction
(All Pollutants Attainment)
Will uncontrolled emission of any pollutant be increased more than 100/250 T.P.Y.?
Ignore reductions
No
Not Subject to PSD
Yes
Identify Each
SUBJECT TO PSD
Identify pollutants increased (after control) greater than 50 T.P.Y. (Ignoring decreases)
None
Tier 1
-NSPS Only
-Class I Area Impact Analysis
Some
Identify emission units contributing to emissions increase
for pollutants < 50 TPY
for pollutants > 50 TPY
Subject to BACT Analysis
Consider decreases - Net emissions increase?
Identify pollutant
No
Yes
Subject to Air Quality and Other Related Impacts Analyses
Reformulate control strategy
Reformulate control strategy
Do all required analyses show:
• no increment or NAAQS violation?
• BACT is applied where required?
• no violation of Class I area requirements?
No
No
YES
RECEIVE PSD PERMIT
Under 1980 PSD Regulations
Proposed Construction
(All Pollutants Attainment)
Is source "Major" before construction?
Yes
No
Significant net increase?
Identify pollutant
Yes
No
Will net increase be "Major"?
Identify pollutant
No
Yes
Yes
Not Subject to PSD
Identify emission units contributing to net pollutant increase

decrease could be exempt from the air quality review requirements provided there would be no adverse air quality impact or impact upon Class I areas or increment violations.

APPENDIX B. DATA BASE OF PSD PERMIT APPLICATIONS

B.1 INTRODUCTION

Development of PSD Permit Data Base

The first step in this project was to determine which EPA regions were to be sampled, how many applications were to be sampled in each region, what types of sources should be sampled and what types of information should be collected from each PSD application sampled. Data selection criteria, quality control procedures and computer data base development and management procedures were also established.

To aid the development of data selection criteria and sampling protocols, TRW assessed three existing data bases containing PSD applications. These data bases are: (1) the Dames and Moore data base compiled for the National Commission on Air Quality (NCAQ); (2) the PEDCo Environmental, Inc. data base compiled for the EPA, and (3) the Arthur D. Little, Inc. data base compiled for the Business Round Table. These data bases contain permit information covering differing time spans and permits from various EPA regional offices. An analysis of these existing data bases aided in the development of the number of PSD permits sampled in each region and the initial EPA regions from which data was collected.

EPA Regional Offices Sampled

Data sampling at the ten EPA regional offices occurred in two different phases. In the first phase, data was collected from EPA Regional Offices II - VII, and IX between February 23, 1981 and April 10, 1981. In the second phase, data was collected from EPA Regional Offices I, VIII and X between August 17, 1981 and August 28, 1981.

During the first phase of data collection, EPA regional offices were selected for sampling on the basis of NSR permit activity and major source industrial activity. After examination of the three reference data bases discussed in B.1.1, the seven EPA Regional Offices II - VII, and IX were selected. The three EPA Regional Offices I, VIII and X not originally sampled, but were included into the data base at a later date to provide PSD application information on a nationwide scale. A total of 285 PSD applications representing the ten EPA regions were included in the data base. A listing of these by EPA region is included in the back of this appendix.

Selection of the Number of Applications to be Sampled in Each EPA Region

The number of PSD permits in each EPA region to be sampled was selected based upon the following criteria:

1) To reflect the effects of the most current PSD regulations,
2) To be representative of the types of sources receiving PSD permits, and
3) To proportionately represent those areas of the country that have experienced high industrial activity.

Based on these considerations, a determination was made to sample between 15 and 45 of the most recent PSD permits issued in each region. Previous studies have shown that EPA Regions IV and VI, collectively have issued 40-50% of the PSD permits in the country. Therefore, more emphasis was placed on amount of data collection from these regional offices. Additionally, an attempt was made to obtain data from every PSD permit issued subject to the 1980 PSD regulations.

The number of PSD permits issued by each EPA region in the years 1978, 1979, and 1980 are as follows:

EPA Region	# of PSD Permits Issued (1978 - 1980)
1	17
2	52
3	90
4	414
5	60
6	191
7	51
8	78
9	114
10	36
Total	1103

As shown on Table B-1, the number of permits sampled ranged from 17 in Region I, where there has been little PSD activity, to 45 in Region IV, which has experienced the most PSD activity of EPA regions.

Data Selection Criteria

Information was obtained from a PSD application and permit and entered into the data base provided the following criteria were met:

1) The PSD permit for the application was issued or a preliminary determination summary indicating an intent to permit was approved; and
2) The PSD permit was issued after March 1, 1978.

In those cases where the determination of whether to include the application into the TRW data base under the above criteria was unclear, discussions with the EPA permit engineer were held before the final decision was made. Of the 285 PSD applications included in the data base, 276 applications had final PSD permits issued; five had only preliminary determinations; three had gone to public notice; and one had gone to public hearing.

All permit information was obtained from EPA regional office files. Information was extracted from preliminary determination summaries, permits and the applicants original application and subsequent correspondence with the reviewing authority. Review agency permit engineers were interviewed whenever possible to clarify issues or provide information that was not

Table B-1. DATA BASE PSD APPLICATIONS BY REGION AND SOURCE CATEGORY

Source Category	REGION										
	I	II	III	IV	V	VI	VII	VIII	IX	X	Total
Electric plants with greater than 250 MMBTU/hr heat input	1	1	4	6	5	4	5	5	5	3	39
Coal cleaning plants (with thermal dryers)	0	0	0	0	2	0	0	0	0	0	2
Kraft pulp mills	2	1	1	6	0	1	0	0	0	3	14
Portland cement plants	0	0	0	0	0	2	0	3	0	0	5
Primary zinc smelters	0	0	0	0	0	0	0	0	0	0	0
Iron and steel mills	0	1	2	0	1	0	0	0	0	0	4
Primary aluminum ore reduction plants	0	2	0	3	0	0	1	0	0	1	7
Primary copper smelters	0	0	0	0	0	0	0	0	0	0	0
Municipal incinerators capable of charging more than 250 tons of refuse per day	1	0	1	0	0	0	0	0	0	0	2
Hydrofluoric acid plants	0	0	0	0	0	0	0	0	0	0	0
Sulfuric acid plants	0	0	0	0	0	0	1	0	0	0	1
Nitric acid plants	0	0	0	0	0	0	0	0	0	0	0
Petroleum refineries	0	1	2	3	0	6	3	1	7	3	26
Lime plants	0	0	0	1	2	0	0	0	0	1	4

(continued)

Table B-1. Continued

Source Category	REGION										Total
	I	II	III	IV	V	VI	VII	VIII	IX	X	
Phosphate rock processing plants	0	0	0	4	0	1	0	0	0	0	5
Coke oven batteries	0	0	0	0	1	0	0	0	0	0	1
Sulfur recovery plants	0	0	0	0	0	0	0	0	0	0	0
Carbon black plants (furnace process)	0	0	0	0	0	2	0	0	1	0	3
Primary lead smelters	0	0	0	0	0	0	0	0	0	0	0
Fuel conversion plants	0	0	0	0	0	0	1	0	0	0	1
Sintering plants	0	0	0	0	0	0	0	0	0	0	0
Secondary metal production plants	0	0	0	0	2	0	0	0	0	1	3
Chemical process plants	1	8	6	9	3	7	0	0	0	1	35
Petroleum storage and transfer units with a total storage capacity greater than 300,000 barrels	0	0	1	0	0	0	0	0	0	0	1
Taconite ore processing plants	0	0	0	0	0	0	0	0	0	0	0
Glass fiber processing plants	0	0	0	0	1	1	0	0	0	0	2

(continued)

Table B-1. Continued

Source Category	REGION										Total
	I	II	III	IV	V	VI	VII	VIII	IX	X	
Charcoal production plants	0	0	0	0	0	0	0	0	0	0	0
Coal mining	0	0	0	0	1	0	0	2	0	0	3
Iron ore mining	0	0	0	0	0	0	0	0	0	0	0
Stone quarry	0	3	1	0	0	0	0	0	0	0	4
Other mining	1	0	0	0	0	0	0	0	1	0	2
Natural gas and crude oil pumping stations	0	0	0	1	4	12	2	11	2	11	43
Municipal incinerators capable of charging less than 250 MMBTU/hr heat input	3	1	0	1	0	0	0	0	0	0	5
Petroleum storage and transfer units with a total storage capacity less than 300,000 barrels	0	0	1	0	0	0	0	0	0	0	1
Asphalt production plants	3	5	4	0	2	0	0	1	1	0	16
Miscellaneous petroleum product production (greases, waste oil processing, etc.)	1	0	0	0	0	0	0	0	1	0	2

(continued)

Table B-1. Continued

Source Category	REGION										Total
	I	II	III	IV	V	VI	VII	VIII	IX	X	
Rubber and plastic production plants	0	1	0	2	0	0	0	0	0	0	3
Textile manufacturing	0	0	0	1	0	0	0	0	0	0	1
Lumber and wood products manufacturing	4	0	0	1	1	1	0	0	0	1	8
Agricultural chemical production (fertilizers, pesticides, etc.)	0	0	0	0	0	0	0	0	1	0	1
Natural gas processing plant	0	0	0	0	0	0	0	2	0	1	3
Solid waste reclimation	0	0	1	0	0	0	0	0	0	0	1
Graphite electrode plant	0	1	1	0	0	0	0	0	0	0	2
Automotive part manufacturing	0	0	0	1	4	0	2	0	0	0	7
Kaolin processing	0	0	0	1	0	0	0	0	0	0	1
Food processing	0	1	0	4	0	0	0	0	1	0	6
Printing plant	0	0	0	1	1	0	0	0	0	0	2
Salt manufacturing	0	1	0	0	0	0	0	0	0	0	1

(continued)

Table B-1. Concluded

Source Category	REGION										Total
	I	II	III	IV	V	VI	VII	VIII	IX	X	
Brewery	0	1	2	0	1	1	0	0	0	0	5
Computer manufacturing	0	2	0	0	0	0	0	0	0	0	2
Glass manufacturing	0	0	1	0	1	1	0	0	1	0	4
Geothermal power steam electric plant	0	0	0	0	0	0	0	0	1	0	1
Other	0	0	2	0	0	0	0	1	1	2	6
Total	17	30	30	45	32	39	15	26	23	28	285

found in any of the appropriate documents. Also, telephone conversations with the respective PSD applicants and the EPA regional PSD contacts were made to gather additional data and to clarify any discrepancies found in the sampled data.

Data Collection Procedures

Trained TRW permit engineers were sent to the ten EPA regional offices to gather PSD permit information. On arrival at the regional office, the engineer determined the location of the needed information and the EPA permit engineers responsible for review of each of the NSR pre-construction applications. The TRW engineer then selected the most recent NSR permits issued in the region (based on the criteria of Section B.1.4) and proceeded to fill in the data collection forms found in Appendix G. One form was filled out for each PSD permit sampled. Information selected included: source type, gross and net emissions increases and decreases, monitoring information and air quality modeling results. Information on individual new or modified emission units included descriptive information, permitted emissions, NSPS information and BACT information for each pollutant subject to PSD review. For those sources where increment consumption was shown to be greater than 85 percent, interviews with EPA permit engineers were conducted to determine if an increment restriction influenced the selection of BACT or process design of the source.

After completion of the data collection tasks in the field, the forms were brought back to TRW for proofing and completeness checks. The information was then transferred from the data collection form onto a data coding form. The data coding form and codes are found in Appendix I. Information from the data coding form was then transferred to computer tape.

Quality Control Procedures

Quality control of all data collection and analyses tasks was ensured by the following procedures:

1) Selection of a uniform set of data from each PSD permit sampled,
2) Pretesting of all data collection forms,
3) Use of personnel with firsthand experience in all phases of the PSD permitting process and regulations,

4) At least two randomly selected independent reviewers, besides the actual TRW engineer that collected the data, reviewed both the data collection and data coding forms for completeness, accuracy and logic,

5) Any data which appeared unrealistic or abnormal was rechecked by communication with the permit engineer at the State or EPA regional office, and

6) Data totals were checked by two independent methods. Each value was required to be within 3% of its "check". Otherwise, the reason for the inconsistency was investigated until found and corrected.

The accuracy of data processing was checked at the levels of source transcription, data coding, and code punching. During data coding, each sheet was again checked three times: first by the coder, second by another staff person uninvolved with the data collection, and lastly by the project manager.

B.2 DATA BASE SOURCE TYPES AND PROJECT DESCRIPTIONS

Source Types

Table B-1 presents the source categories represented by the data base PSD applications in each EPA region. This table is an expansion of Table 2-1 provided in Section 2.0. Whenever possible, SIC codes were referenced for determination of an application's source type. However, no attempt was made to combine all kinds of chemical process plants that would fall under a single SIC major code into one source type. "Chemical process plants" are those in Table B-1 that have been referenced as a chemical plant in the PSD permit or preliminary determination for the plant and cannot be categorized into other source types included in the table.

Table 2-1 of Section 2.0 has been condensed by combining similar source types. For example, the "chemical plants" source category in Table 2-1 includes hydrofluoric, sulfuric and nitric acid plant source categories as well as the "chemical process plant" source category listed in Table B-1.

New Major Sources and Major Modifications

Each data base application was classified as either a new major source or a major modification. These classifications are defined for both the 1978 and 1980 PSD regulations in Table A-1 of Appendix A.

The number of data base applications subject to the 1978 PSD regulations which would also be subject to the 1980 PSD regulations was determined. For new major sources, this determination was rather straightforward. For major modifications subject to the 1978 PSD regulations, two conditions must exist that would make them also subject to the 1980 regulations:

1. The source must be "major" prior to the proposed project or the proposed project itself was expected to increase emissions of any pollutant greater than 100/250 t.p.y; and
2. The increase in emissions of any pollutant resulting from the proposed project must be significant.

Criterion #2 above was easily determined from the gathered data but in many cases, evaluation of #1 above, major status of the existing source, was not clear cut. However, the assumption that all sources were indeed "major" prior to application submittal was made. This assumption appears to be valid because many of these sources, were they not "major," may have been entitled to a permit rescission under the 1980 applicability criteria and no permit file indicated any request for rescission.

Project Descriptions

Table B-2 presents a project description summary for the 285 data base applications. This table is an expansion of the data provided in Section 2.2 and includes project descriptions for the number of data base applications reviewed under the 1978 and 1980 PSD regulations. A project description is a brief account of the type of project subject to PSD review. Project descriptions have been classified into new major source construction and major modifications with additions of combustion units, process units, fuel switches, or all combinations of the above. Examples of combustion emissions units are power boilers, furnaces, heaters, and turbines. Process emissions units are those that process raw materials, and intermediate and final products in support of the processes involved. Note that in many cases, a process emissions unit is also a combustion emissions unit.

Table B-2. PROJECT DESCRIPTIONS FOR THE 285 DATA BASE APPLICATIONS

Project Description	Subject Regulations		
	1978	1980	Total
New source construction	71	24	95
Modification of an existing source: additional combustion emission units only added	58	22	80
Modification of an existing source: additional process emission units only added	60	9	69
Modification of an existing source: fuel switch at existing emission units only	1	4	5
Modification of an existing source: additional process and combustion emission units added	23	10	33
Modification of an existing source: additional process, combustion emission units added and fuel switch at existing emission units	2	1	3
TOTAL	215	70	285

B.3 POLLUTANT APPLICABILITY

In support of the analysis of Section 2.3, the number of pollutants subject to PSD review for each application contained in the data base was determined. Figures B-1 and B-2 present the distributions of the number of applications subject to the 1978 and 1980 PSD regulations, respectively, by the number of pollutants reviewed per application.

The 1980 PSD regulations generally tend to require more individual reviews of pollutants than the 1978 PSD regulations. The applicability criteria of the 1980 PSD regulations requires that a new major source, a major modification, or a modification to an existing major source undergo PSD review for each pollutant emitted in significant quantities.

B.4 NONATTAINMENT REVIEW

Thirty-five (35) data base applications were found to be subject to simultaneous PSD and nonattainment review. A source applying for a PSD permit under the 1980 regulations, in some cases, underwent PSD review for one pollutant and nonattainment review for another pollutant. Furthermore, some sources received separate PSD and nonattainment permits, the latter primarily issued by the respective state agency. In these cases, LAER and other nonattainment permit data were not included in the EPA PSD permit file and thus, are not included in the data discussed in this report.

B.5 DATA BASE EMISSION UNITS

The data base consists of 1,126 individual emission units. An emission unit is defined as any part of a stationary source which emits or has the potential to emit any pollutant subject to regulation under the Act.

All emission units were categorized into one of three descriptive categories: combustion emissions units, process emissions units or both. Table B-3 displays the distribution of data base emission units among these categories. In addition, Table B-3 shows the distribution of emission units by new or modified units.

B.6 DATA BASE EMISSIONS SUMMARY

Emissions for each data base application were collected and classified into three groups: gross emission increases, gross emission reductions and

FIGURE B-1. DISTRIBUTION OF THE NUMBER OF APPLICATIONS SUBJECT TO THE 1978 PSD REGULATIONS WITH RESPECT TO THE NUMBER OF POLLUTANTS REVIEWED PER APPLICATION.

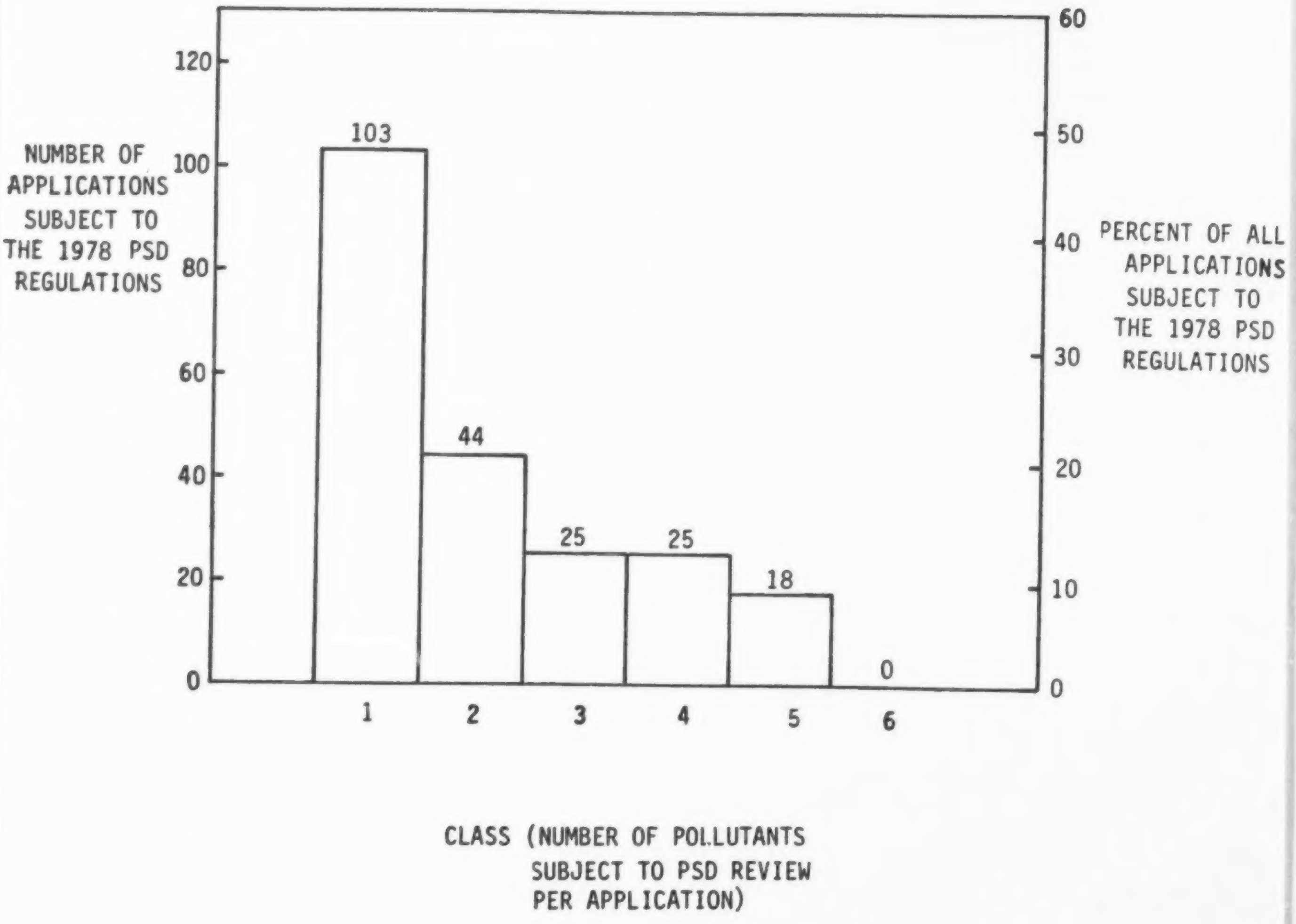


FIGURE B-2. DISTRIBUTION OF THE NUMBER OF APPLICATIONS SUBJECT TO THE 1980 PSD REGULATIONS WITH RESPECT TO THE NUMBER OF POLLUTANTS REVIEWED PER APPLICATION.

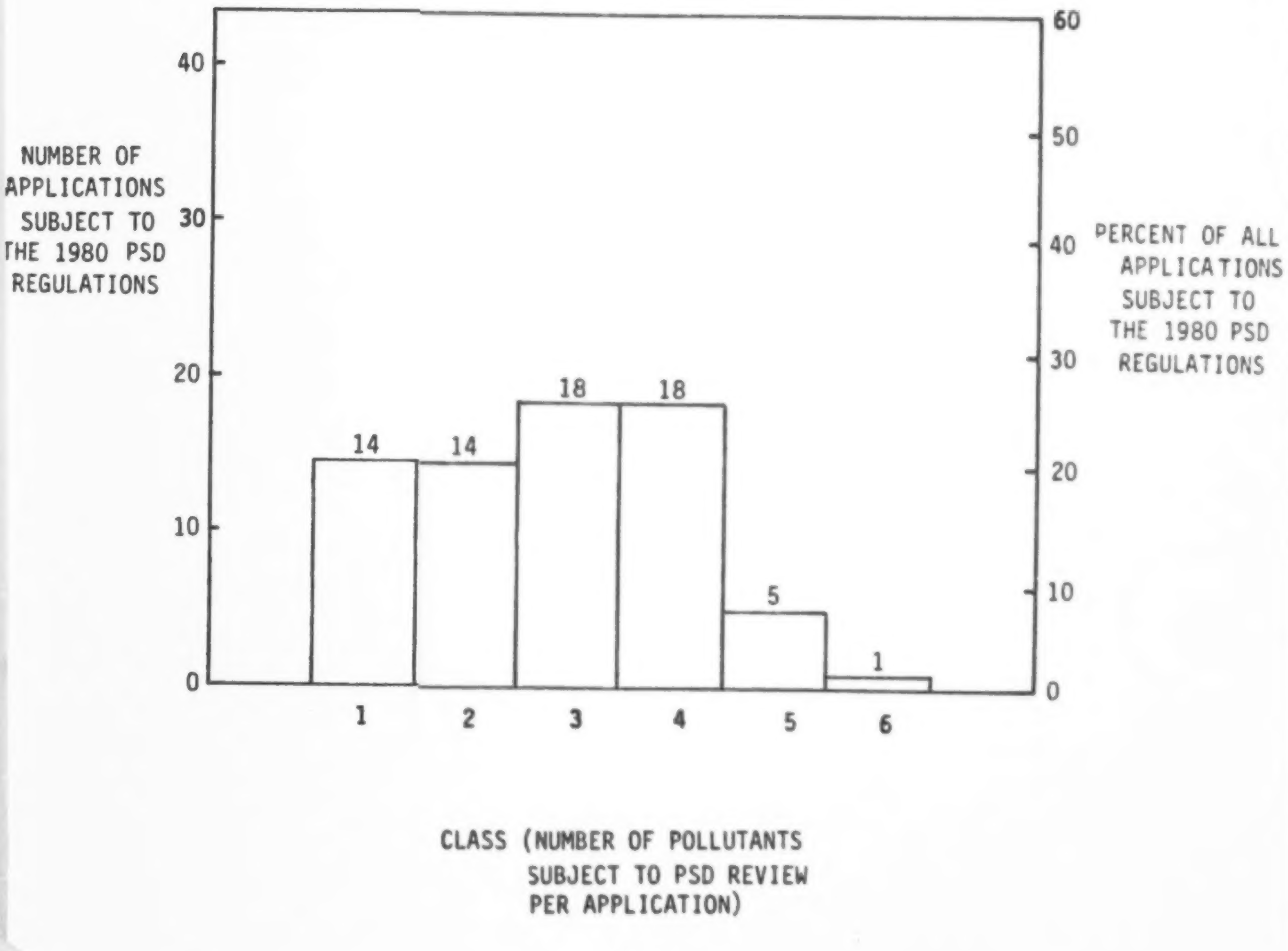


Table B-3. BREAKDOWN OF DATA BASE EMISSION UNITS INTO COMBUSTION, PROCESS OR BOTH CATEGORIES

New and Modified Emission Units

Description	Number of Data Base Emission Units	
	New Emission Units	Modified Emission Units
Combustion Units	597	32
Process Units	303	55
Both	125	14
Total	1025	101

net emissions changes. For this report, "gross emission increases" are the emissions increases after application of air pollution controls and without consideration of emission reductions elsewhere at the source. Gross emission reductions are the reductions of pollutant emissions at the source from existing emission units. Net emissions changes are the level of pollutant emitted after the application of air pollution controls considering emission reductions (gross emission increases - gross emission reductions = net emissions changes).

Table B-4 presents the number of data base applications by region with emission reductions of PM, SO_2, NO_x, CO or VOC (or combination), and the PSD regulations under which the application was subject. Examination of the table shows that 45 data base applications have decreases of at least one pollutant. These decreases are attributable to several causes. In order to avoid an increment or NAAQS violation, applicants chose to reduce emissions at an existing emission unit not subject to review after BACT had been applied to new or modified emission units. Similarly, a source subject to nonattainment provisions was required to at least "offset" proposed emissions increases, usually at other emissions units. To be enforceable, these "offset" emission units were, in some cases, specified in the PSD permit. Furthermore, many PSD applications indicated emissions reductions accompanying emissions increases, such as cases involving replacements.

B.7 AIR QUALITY DATA

For each application in the data base, information was collected on the pollutants subject to an air quality dispersion modeling analysis, the monitoring information required, the years of meteorological data modeled, and whether or not fugitive emissions were modeled. Data were also collected on the ambient air concentrations predicted in the modeling analyses. In those cases of high ambient air impacts, investigations were conducted to determine the effects of the modeling analyses on BACT determinations.

Figures B-3 and B-4 present a distribution of the number of applications subject to air quality dispersion modeling analyses under the 1978 and 1980 PSD regulations with respect to the number of pollutants reviewed

Table B-4. NUMBER OF APPLICATIONS IN EACH EPA REGION WITH EMISSIONS REDUCTIONS AND THE PSD REGULATIONS UNDER WHICH THE APPLICATION WAS SUBJECT

	Number of Applications with Emissions Reductions of at Least One Pollutant		
Region	Subject to the 1978 PSD Regulations	Subject to the 1980 PSD Regulations	Total
I	6	0	6
II	2	1	3
III	1	0	1
IV	2	5	7
V	10	0	10
VI	1	3	4
VII	2	1	3
VIII	0	0	0
IX	8	0	8
X	2	1	3
TOTAL	34	11	45

FIGURE B-3. DISTRIBUTION OF THE NUMBER OF APPLICATIONS SUBJECT TO AIR QUALITY DISPERSION MODELING ANALYSES UNDER THE 1978 PSD REGULATIONS BY THE NUMBER OF POLLUTANTS SUBJECT PER APPLICATION.

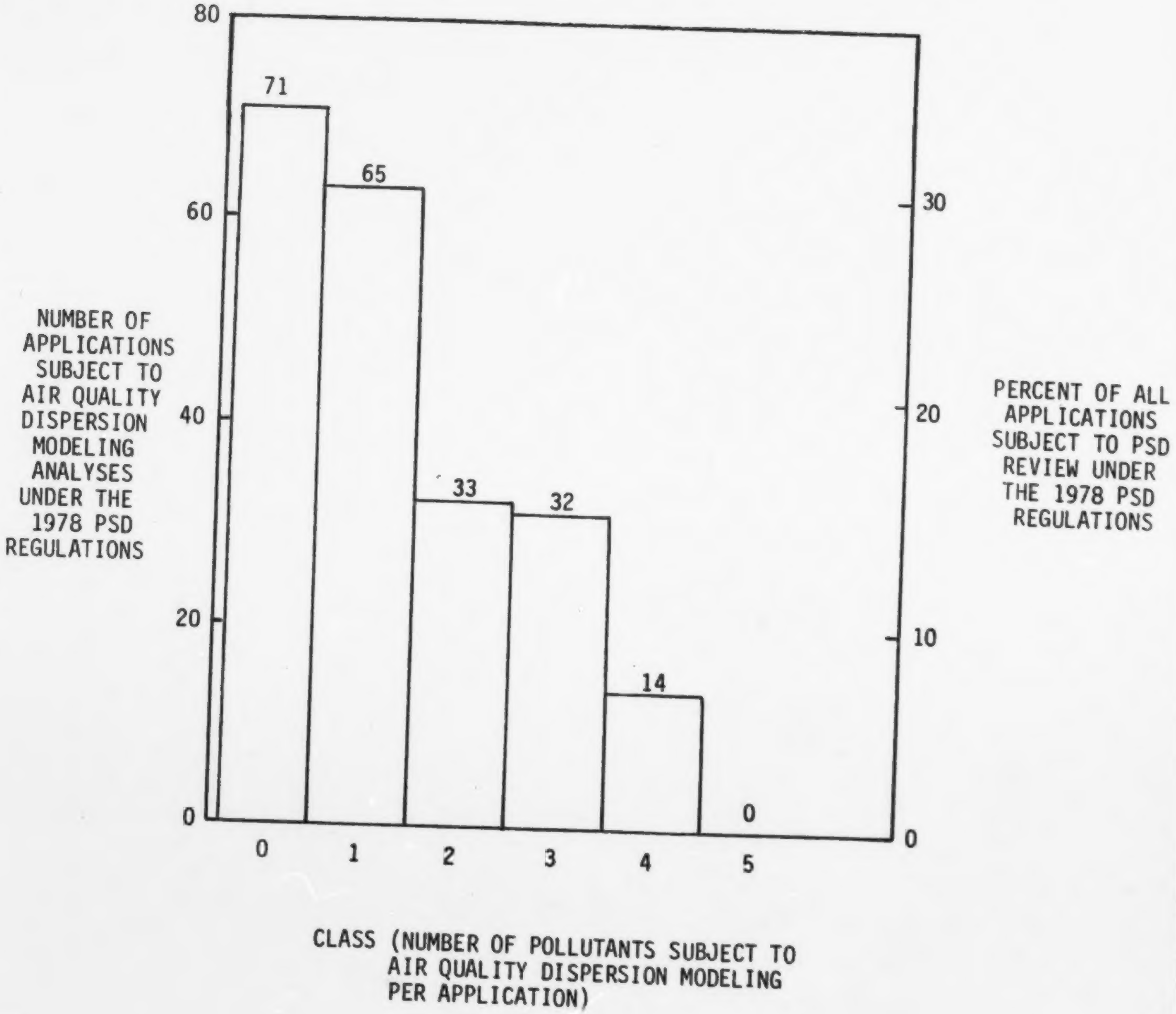
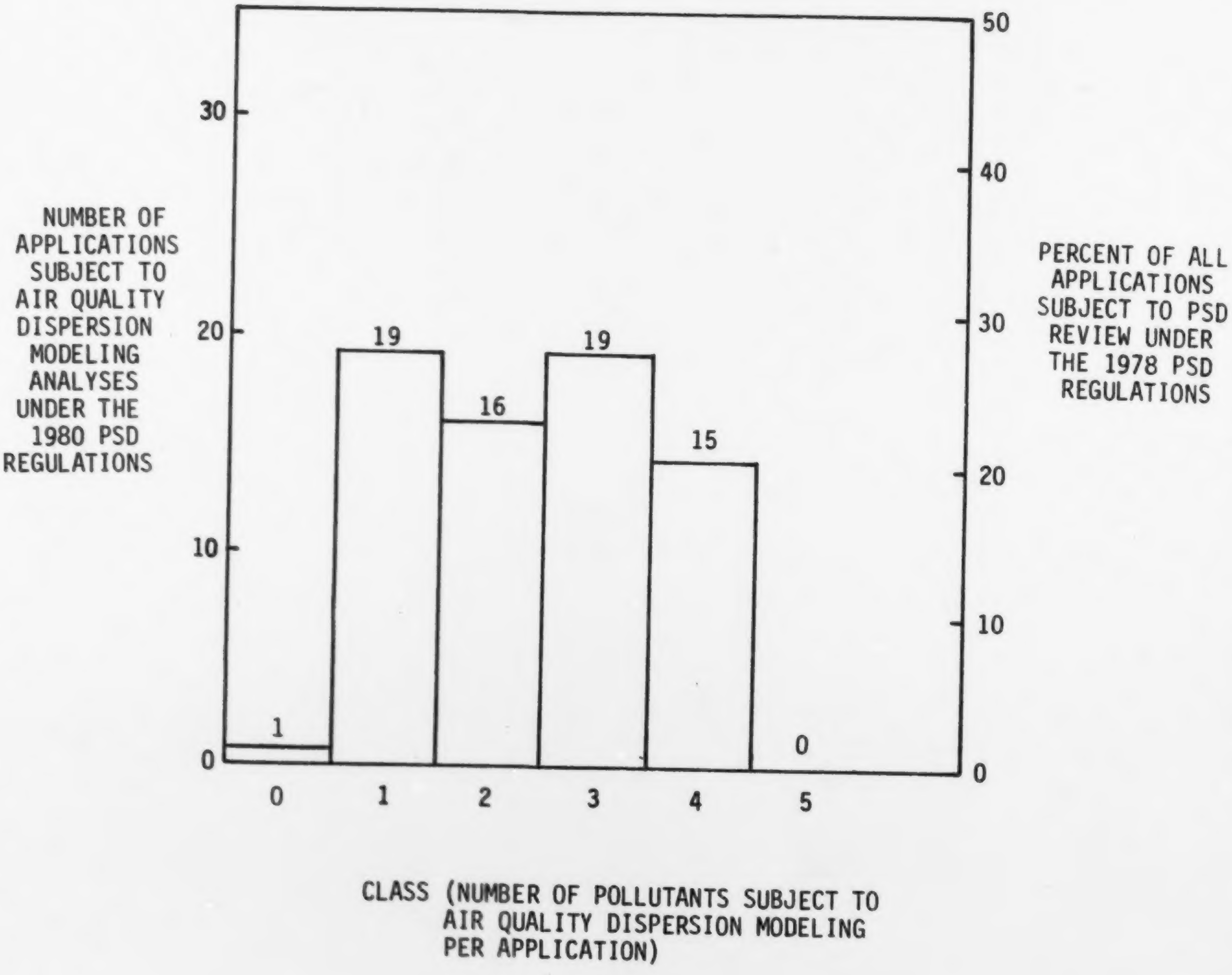


FIGURE B-4. DISTRIBUTION OF THE NUMBER OF APPLICATIONS SUBJECT TO AIR QUALITY DISPERSION MODELING ANALYSES UNDER THE 1980 PSD REGULATIONS BY THE NUMBER OF POLLUTANTS SUBJECT PER APPLICATION.



per application. As shown in Figure B-3, about 1/3 of the PSD applications subject to the 1978 regulations performed no dispersion modeling. Dispersion modeling was generally not required for applications involving "Tier 1" reviews or those subject to review only for VOC emissions.

B.8 PSD APPLICATION SUBMITTALS

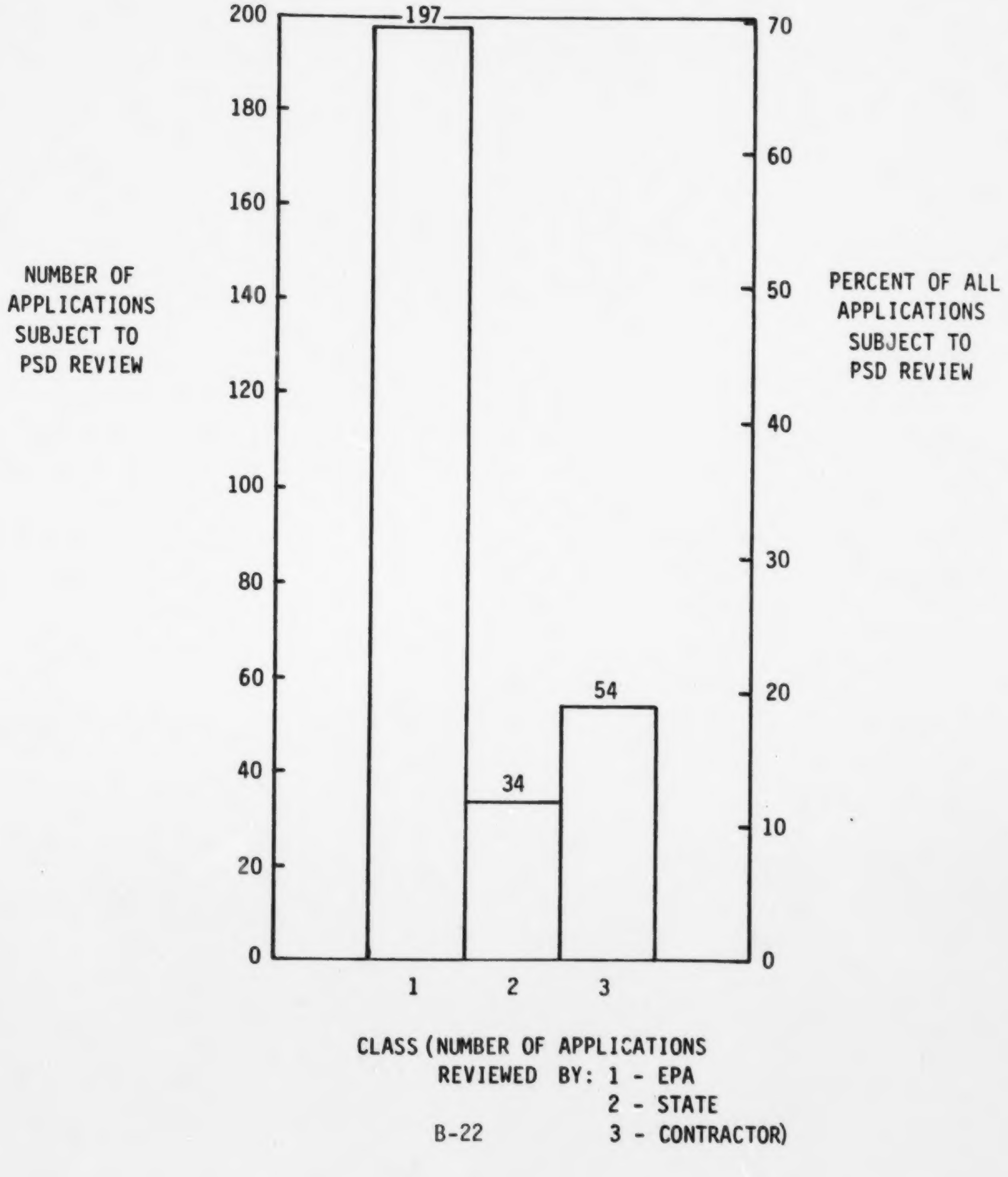
Data base application submittal dates were compared to actual or anticipated major regulatory date changes in the New Source Review program. A brief history of new source review regulations is found in Appendix A.

B.9 PSD REVIEW AUTHORITY

All data base applications were categorized as having been reviewed by one of the following: EPA, State, or contractor assisting either the EPA or the State. In some EPA regions, some or all of the states in the region may have been granted PSD review authority while in other areas, the EPA was the review authority. EPA Region III, IV, VI, VIII, and IX have had assistance in review of PSD applications by a contractor.

Figure B-5 presents a distribution of the number of data base applications reviewed with respect to the agency performing the review.

FIGURE B-5. DISTRIBUTION OF THE NUMBER OF PSD APPLICATIONS REVIEWED WITH RESPECT TO THE AGENCY PERFORMING THE REVIEW.



CLASS (NUMBER OF APPLICATIONS
REVIEWED BY: 1 - EPA
2 - STATE
3 - CONTRACTOR)

Data Base PSD Applications by EPA Region

REGION 1

Source Name	Permit Number
Natick Paperboard, Inc.	24 119 MA 13
Oxford Paper Co., Boise Cascade	003 107 ME 01
Pike Industries, Inc.	013 221 VT 02
The City of Cranston	016 120 RI 01
Norton Company	014 118 MA 07
James River Corporation	010 107 NH 02
W. R. Grace & Company	005 121 NH 01
Mass. Municipal Whsl. Electric Co.	002 042 MA 01
Refuse Fuels, Inc.	023 121 MA 12
Great Northern Paper Co.	006 109 ME 03
The City of Lynn	012 119 MA 06
The City of Fall River	008 120 MA 04
Hollingsworth & Voss Co.	018 121 MA 08
Diamond International Corp./Hyde Park Paper Div.	019 119 MA 09
Flex/Con Co.	011 118 MA 05
Lime Products Corp.	015 107 ME 04
Pike Industries, Inc.	009 159 VT 01

REGION 2

Source Name	Permit Number
Delco-Remy	AQCR 043
Georgia Pacific Corporation	AQCR 158
Ingersoll-Rand	AQCR 151
Nepera Chemical Company	None
Martin Marietta Aluminum	None
A. L. Blades Company	None
Exxon	None
Martin Marietta Aluminum	AQCR 247
B. F. Goodrich Corporation	None
Concrete Materials Corporation	None
Colgate Palmolive Company	None
NYS Electric and Gas Corporation	AQCR 162
Callaman Industries	AQCR 161
Nabisco Company	AQCR 162
Armstrong Cork Company	AQCR 158
Allied Chemicals	AQCR 159
Colgate Palmolive Company	AQCR 043
Oswego Co. Dept. Public Works	AQCR 158
IBM Corporation	None
Hercules, Inc.	None
Burroughs Corporation	None
Buffalo Crushed Stone	None
Southtowns Sewage Treatment	None
Tenneco Chemical	None
Union Carbide Grafito, Inc.	None
Rochester Asphalt Materials	None
GAF Corporation	None
Diamond Crystal Salt Co.	None
Anheuser-Busch, Inc.	None
Witco Chem. Corp.	None

REGION 3

Source Name	Permit Number
Philadelphia Electric Company	80 DE 02
Getty Methanol Corporation	80 DE 01
Delmarva Power and Light	80 MD 01
AIRCO-SPEER	79 PA 26
Molycorp Inc.	79 PA 22
Ashland Chemical Company	78 WV 02
Morgantown Asphalt Company	79 WV 05
Borg-Warner Chemical	80 WV 02
GAF Corporation	79 PA 20
Norfolk & Western Railway	79 VA 14
ARMCO Steel Corporation	79 MD 03
Pendleton Construction Company	79 VA 10
Coal Ind. Ser. Co.	79 VA 11
GPV Service Corporation	78 PA 13
Pulaski Reduction Center	78 MD 09
Anheuser-Busch	79 VA 15
Zarlengo Brothers	79 PA 25
Delaware Solid Waste Authority	79 DE 02
Chesapeake Corporation	80 VA 03
City of Wilkes-Barre	79 PA 23
Roanoke Electric Steel Corporation	78 VA 06
A. I. DuPont Institute	79 DE 01
Smith-Cline Corporation	79 PA 15
Hampton Roads Energy Company	78 VA 01
Radford Army Ammo	79 VA 07
ARCO Pipeline Company	79 PA 24
PPG Industries, Inc.	79 MD 05
Swann Chesapeake Terminal Corp.	78 VA 04
PPG, Ind.	79 WV 06
Adolph Coors	80 VA 01

REGION 4

Source Name	Permit Number
Estech General Chemicals Corp.	FL 036
Coastal Aluminum	NC 072
E. I. DuPont	SC 033
Florida Power Corp.	FL 017
Agrico Chemical Co.	FL 061
Coastal Aluminum	SC 036
W. R. Grace & Co.	FL 068
Reedy Creek Improvement District	FL 044
Tampa Electric Company	FL 040
Jacksonville Electric Authority	FL 010
Occidental Chemical Co.	FL 067
St. Regis Paper Company	FL 041
Diamond Shamrock	NC 058
Mead Corp.	AL 069
B. F. Goodrich	KY 140
Alcoa	NC 078
Hartsville Oil Mill	SC 038
ABI TIBI Corp.	NC 076
Westvaco	SC 037
Shell Oil Co.	MS 025
Exxon Co.	MS 030
Campbell Soup Co.	MC 074
Carolina Refining & Dist Co.	GA 063
B. F. Goodrich	KY 149
SI Lime Co.	AL 070
Lithium Corp.	NC 075
Tennessee Eastman	TN 065
AE Stanley Manufacturing Co.	TN 064
Union Carbide	GA 069
Gilman Paper Co.	GA 071
St. Regis Paper Co.	FL 066

REGION 4 (Concluded)

Source Name	Permit Number
Saginaw Steering Gear	AL 064
Firestone Tire Co.	GA 068
Big Rivers Electric	KY 130
Scott Paper	AL 068
Degussa Chem. Corp.	AL 072
AL Elec. Coop Inc.	AL 071
Kentucky Power	KY 145
Firestone Tire Co.	GA 067
Ashland Petro	KY 0155
Proctor and Gamble	GA 008
Mullite Company	GA 064
Diversified Printing	TN 069
Greenwood Mills	SC 035
USS Agri-Chemicals	FL 064

REGION 5

Source Name	Permit Number
General Motors Corp.	EPA 5 A 80 6
PPG Industries	EPA 5 A 79 27
R. R. Donnelly & Sons Co.	EPA 5 A 80 17
Richardson Asphalt Corp.	EPA 5 A 80 5
J. E. Baker Co.	EPA 5 A 80 15
Central Illinois Light Co.	EPA 5 A 80 21
E. I. DuPont DeNemours & Co.	EPA 5 A 80 7A
Ironton Coke Corp.	EPA 5 A 80 9
Northern Indiana Public Service	EPA 5 A 79 25
Michigan Consolidated Gas	EPA 5 A 79 32
Michigan Wisconsin Pipeline	EPA 5 A 80 2
Consolidation Coal Co.	EPA 5 A 79 29
Borg-Warner	EPA 5 A 80 4
Atlantic Richfield Co.	EPA 5 A 79 24
General Motors Corp.	EPA 5 A 80 11
J. H. Rodolph & Co. Inc.	5 A 80 13
AWR Storage Co.	EPA 5 A 80 1
AWR Storage Co.	EPA 5 A 79 34
City of Columbus	EPA 5 A 80 3
Ford Motor Co.	EPA 5 A 80 19
Miller Brewing Co.	EPA 5 79 A 28
General Motors Corp.	EPA 5 A 80 12
Louisianna Pacific Corp.	EPA 5 A 80 10
Brillion Iron Works	EPA 5 A 79 33
E. I. DuPont DeNemours & Co.	EPA 5 A 81 1
U.S. Gypsum Co.	EPA S A 80 16
U.S. Gypsum Co.	EPA S A 80 14
Northern Indiana Public Service	EPA 5 A 80 18
Consolidation Coal Co.	EPA 5 A 79 30
Michigan South Central Power Age	EPA 5 A 80 20
Rockwell Lime Co.	5 A 79 35
Knauf Fiber Glass	EPA 5 A 79 31

REGION 6

Source Name	Permit Number
Lake Charles Refining Co.	LA 366
E. I. DuPont DeNemours & Co.	LA 335
Ashland Chemical Co.	LA 339
Guardian Ind.	TX 370
Odessa Natural Corp.	TX 368
Panhandle Eastern	OK 329
Panhandle Eastern	OK 330
BASF-Wyandotte Corp.	LA 369
Amerada Hess Corp.	TX 328
Panhandle Eastern Pipeline	TX 320
Panhandle Eastern Pipeline Co.	TX 322
Shintech Inc.	TX 327
Brazos Coal Ltd.	TX 309
Gulf Oil Chemicals	TX 299
Colorado Interstate Gas	OK 358
Panhandle Eastern Pipeline Co.	TX 321
Texaco Inc.	LA 378
Exxon Co.	TX 362
Arkansas Eastman	AR 311
Fort Howard Paper Co.	OK 375
Saber Refining Company	TX 324
Southwestern Portland Cement Co.	TX 351
Southwestern Electric Power Co.	TX 340
Georgia-Pacific Corp.	LA 341
PPG Industries	TX 290
Sun Gas Co.	TX 372
Good Hope Refinery	LA 318
Crystal Oil Co.	TX 364
Anheuser-Busch Inc.	TX 246
SW Electric Power Co.	LA 117

REGION 6 (Concluded)

Source Name	Permit Number
Plains	NM 82
Ashland Chemical Co.	LA 338
SW Portland Cement Co.	TX 352
Shell Oil	TX 360
Tex-USS	TX 336
Mapco Alcohol Fuel Inc.	TX 374
Southern Natural Gas	LA 267
Diamond Shamrock Corp.	TX 346
Freeport Chemical Co.	LA 316

REGION 7

Source Name	Permit Number
Empire District Co.	None
Panhandle Eastern	None
Missouri Public Service	None
Muscatine Power & Water	None
Getty Oil	None
Noranda Aluminum	None
General Motors	None
Panhandle Eastern	None
Sunflower Army Ammo	None
CRA	None
Amer. Mod. Food Sys.	None
CRA	None
Sunflower Elec	None
General Motors	None
Iowa Illinois Gas & Elec.	None

REGION 8

Source Name	Permit Number
High Prairie Energy Co.	300600
Utah Power & Light Co.	490342
Occidental Oil Shale Inc.	81621,81622
Geokinetics Inc.	490005
Amoco Production Co.	490003
Publishers Paper	X80 03
Colorado Interstate Gas	None
Intermountain Power	None
Shell Oil - Buckskin Mine	None
Platte River Power Authority	81626
Colorado Ute Power Co.	81620
Martin Marietta Cement	490367
Carter Mining Co.	541211
Portland Cement Co. of Utah	490361
Beehive Cement Co.	490337
Union Oil Co. of GA	80031
Descret Gen & Tran Corp.	None
Rodney Rasmussen C	None
Malestrom A.F.B.	None
Panhandle Eastern Pipeline	None
Colorado Interstate Gas	None
Colorado Interstate Gas	None
Colorado Interstate Gas	None
Colorado Interstate Gas	None
Colorado Interstate Gas	None
Colorado Interstate Gas	None
Colorado Interstate Gas	None

REGION 9

Source Name	Permit Number
Petro-Lewis Corp.	NSR 4 4 8 SJ 79 28
Kernridge Oil Co.	NSR 4 4 8 SJ 80 06
Martin Marietta Corp. Inc.	NSR 4 4 9 LA 80 03
The Anaconda Co.	NSR 4 7 3 NV 79 01
Getty Oil Co.	NSR 4 4 8 SJ 79 03
Chevron USA Inc.	OCS 79 01
Tuscon Electric Power Co.	A 20 79 01
FMC Corp.	NSR 4 4 8 SJ 79 08
Ogle Petroleum Inc.	NSR 4 4 8 SJ 79 09
Provident Energy Co.	NSR 4 1 2 AZP 79 02
Chevron USA Inc.	SJ 79 12
Sabre Refining Inc.	SJ 79 06
Hawaiian Independent	USR 4 9 HI 78 04
Modesto Irrigation District	NSR 4 4 8 SJ 79 16
Pacific Gas & Electric Co.	NC 79 01
Tosco Corp.	SJ 78 26
Guardian Industries Corp.	NSR 4 4 8
Granite Construction Co.	NSR 4 4 5
Union Oil of CA	LA 79 02
Nevada Power Co.	NSR 4 7 1 NV 79 03
Nevada Power Company	NV 80 01
Nevada Power Company	NSR 4 7 1 NV 78 02
Nevada Power Company	NV 77 01

REGION 10

Source Name	Permit Number
Weyerhauser Longview	X81 02
Tesoro Petroleum	X80 07
Shell Oil	X80 5
Idaho Natural Eng. Lab	X81 11
Precision Castparts	X80 06
Northwest Alaskan Pipeline Co.	X81 07
Northwest Alaskan Pipeline Co.	X81 08
Northwest Alaskan Pipeline Co.	X81 02
Northwest Alaskan Pipeline Co.	X81 06
Northwest Alaskan Pipeline Co.	X81 05
Northwest Alaskan Pipeline Co.	X81 04
Northwest Alaskan Pipeline Co.	X81 03
Pacific Alaska Lng Assoc.	X80 10
Alyeska Pipeline Service Co.	X80 19
Alyeska Pipeline Service Co.	X80 04
Arco Oil and Gas Co.	X81 01
Puget Power & Light	X80 17
Kaiser Aluminum & Chem. Corp.	X80 13
Arco/SOHIO	X80 09
Ash Grove Cement Co.	X80 16
Potlatch Corp.	X80 18
Washington Water Power Co.	X80 11
U.S. Dept. of Energy	X80 14
Fairchild AFB	X80 12
Bolse Cascade-Plywood	X79 07
Puget Power & Light	X80 02
Alaska-Petrochemical	X80 03

APPENDIX C. PSD PERMIT PROCESSING TIMES

C.1 INTRODUCTION

The analyses of Section 3.0 are based on the time necessary to process a PSD application through three distinct permitting stages. These stages are outlined in Section 3.1. The following dates corresponding to the permitting stages were collected for each data base application:

1. First pre-submittal contact between applicant and review agency;
2. Initial application submittal;
3. Last information submittal;
4. Determination of a complete application; and
5. Permit issuance.

As of September 10, 1981, there were 156 PSD applications on file in EPA regional offices awaiting permit decisions. The submittal dates of these "in process" applications range from August 1977 to August 1981. However, 73 of these were less than 6 months old and, in most cases, were determined "complete" shortly after submittal. Many of the remainder had not received their permits due to reasons attributable to the PSD permitting process such as:

1. Inability to comply with allowable PSD increments or other air quality issues;
2. Public opposition to the proposed project causing public hearings and, in some cases, litigation;
3. Federal land manager intervention and opposition to the proposed project due to potential adverse impacts (soils, vegetation, visibility, etc.) on Class I areas; and
4. Applicant inability to start construction within specified time limits resulting in applicant requests for permit issuance delays.

In some cases where the PSD applicant is unable to demonstrate compliance with a requirement, it has been common practice for the reviewing authority to put the PSD application "on hold" rather than deny the permit.

These "in process" PSD applications are neither included in the data base nor analyzed in this report. Therefore, analyses presented in this report are based only on PSD permits (or permit decisions) "issued" and should only be used to indicate permit processing times for those PSD applications that do not involve special circumstances. In 9 of the PSD data base applications, the date of permit issuance used in the analyses is actually the preliminary determination date (5), public notice date (3) and public hearing date (1). No time compensation was made for these in any analyses. These dates were collected based on the data selection criteria found in Appendix B. In all of these cases, the review authority has indicated an intent to issue the PSD permit in accordance with the conditions reflected in the data base.

C.2 SUMMARY OF PSD PERMIT PROCESSING TIMES

Total Processing Time

Delays in PSD permit processing times usually result when any of the following stages of PSD processing must be repeated:

1. Application preparation and submittal;
2. Agency review for "completeness";
3. Preliminary determination, draft permit preparation and public comment period.

For instance, incomplete application submittals generally required more data preparation resulting in permitting delays.

In a few cases, delays occur even after the reviewing authority has reached a permitting decision and issued a draft permit and preliminary determination. These delays result from:

1. Disagreement between the PSD applicant and the permitting authority over permit conditions;
2. Significant adverse public comments requiring responses; and
3. Public hearings.

Although not considered in the analysis presented in Section 3.2, the time that an applicant must devote to preparing a PSD application varies widely. This time increases if: (1) the applicant is not familiar with how the required analyses are to be performed; (2) addition information is needed such as monitoring data (i.e., no representative data already exists); and (3) the modeling analyses are complicated by proximity of the prospective source to Class I areas.

Application Completeness

Reviewing authorities have regarded a "complete" PSD application as one that contains sufficient information to make a permitting decision. However, in the majority of the early cases, additional information was required after the application was deemed "complete" in order for the reviewing agency to make a permitting decision. Additionally, the definition of "information necessary to make a permitting decision" was found to vary somewhat from region to region and among different reviewing agencies. However, much of the variation was found to depend on location-specific factors such as:

1. Proximity to Class I areas;
2. Complex terrain issues; and
3. Areas of high increment consumption.

These location or region-specific factors prompted reviewing authorities to require more detailed analyses of some issues and perhaps less detailed analyses of others. This situation resulted in the absence of a "nationally uniform" criteria for information sufficiency.

Permit Processing Time from Receipt of a Complete Application

Ideally, at the time an application is called "complete", the reviewing authority has all the information necessary to make a permitting decision. Forty-nine (49) percent of the data base applications took greater than six months after the date of completeness to get a final permit issued. The actual reasons for permitting delay are case specific and not totally identified in this report.

C.3 EFFECT OF SOURCE SIZE AND TYPE OF REVIEW ON PROCESSING TIMES

To assess the effect of source type on processing times, data base applications were divided into utility (39 applications) and non-utility sources (246 applications). An analysis of the length of time between initial application submittal and permit issuance for each of these two groups was conducted.

A similar analysis to that above was also undertaken with the data base applications divided into new major sources (95) and major modifications (190).

To assess the relationship of source size to permit processing time, the data base applications were again divided into new major sources and major modifications. An analysis was conducted between length of permit processing time and size of application. For this analysis, size of application was defined as the largest pollutant permitted for the application. Only those applications with a "net emissions increase" of a criteria pollutant were used in the analysis. The data base applications were divided into those with total processing times less than 6 months and those with total processing times greater than 6 months. A T-test was conducted comparing the mean source size of these two groups of applications. The analysis was also run for new major sources and modifications. Also, the analyses were run dividing the applications into groups using nine month and twelve month processing times. The following relationships between processing time and source size were found:

1. In each T-test, a significant difference ($p < .10$) between the two groups of applications was found; and
2. The means of the application groups increased with processing time indicating that the larger applications had longer processing times.

This was found to be the case for major modifications, but not for new major sources.

C.4 EFFECT OF PRE-APPLICATION CONTACT ON PROCESSING TIMES

The analysis of initial contact dates results from an investigation of 214 PSD applications in EPA Regional Offices II - VII, and IX. Information for these applications was gathered during the first phase of data collection as described in Appendix B. Pre-application contact dates for the remaining 71 data base applications were not available at the time of analysis. Pre-application contact is defined as meetings, letters, telephone conversations or any other documented form of contact between the applicant and review agency personnel. Of the 214 applications, 9 were not included because they did not have final permits at the date of the analysis. Fifty-six (28.4%) of the remaining permits were determined to involve some form of pre-application contact, usually pre-application meetings with the reviewing authority.

C.5 PERMIT PROCESSING TIMES FOR APPLICATIONS SUBJECT TO BOTH PSD AND NONATTAINMENT REVIEW

There are 35 cases identified in the data base which were reviewed for both PSD and nonattainment. In 12 cases, the applicant was subject to nonattainment review for pollutants which, at the time of application processing, were not "officially" designated as requiring nonattainment permitting. This occurred where impact areas for the pollutant (mostly VOC) were designated as "unclassified" with respect to attainment status or dispersion modeling indicated a potential violation of a NAAQS. In some of these cases, instead of acquiring sufficient ambient monitoring data to classify these areas, the applicant chose to "assume", in the worst case, that nonattainment provisions would apply. The applicant then applied LAER (Lowest Achievable Emission Rate) and obtained appropriate offsets in an effort to avoid permit processing delays. This action simultaneously satisfied both the PSD and nonattainment provisions. These cases were not analyzed in this section.

In 4 other cases, it was unclear from the data in the PSD files why the applicant was subject to nonattainment provisions. At the time of writing this report, the issues concerning these cases were not sufficiently clarified to justify inclusion in this section. However, 4 other cases, which do not appear in the TRW data base were identified by EPA regional office personnel as requiring nonattainment reviews and these are included in this section. Therefore, this analysis focuses on 23 NSR permit applications subject to concurrent PSD and nonattainment review. Table C-1 presents a summary of the permitting delays for these.

Table C-1. SUMMARY OF PERMITTING DELAYS FOR APPLICATIONS REQUIRING PSD AND NONATTAINMENT REVIEW

EPA Region	Company Name	PSD Permit No.	Total Permitting Period (Months)[a]	Extra Time Attributable to Non-attainment Review (Months)[c]	Other Delaying Factors
4	Gilman Paper Co.	GA-071	3.5	0.0	None.
4	Firestone Tire Co.	GA-067	4.8	0.0	None.
4	Ashland Petroleum	KY-155	6.0	0.0	None.
6	Conoco	LA-390	6.0[b]	2.0[b]	None.
9	Kenridge Oil Co.	SJ-80-06	6.6	0.0	None.
6	B. F. Goodrich[d]	LA-326	7.5	0.0	None. Also received NESHAPS permit during permitting time with no delays.
6	Dow Chemical[d]	LA-393	8.0	0.0	None.
5	General Motors Corporation	EPA-5-A-80-6	10.0	0.0	BACT analysis disputes.
6	Crystal Oil Co.	TX-364	12.8	2.0	PSD application incomplete.
6	Saber Refining Co.	TX-324	13.0	0.0	PSD application incomplete due to modeling disputes and inadequate technical information.
6	Ashland Chemical	LA-339	13.5	0.0	Company error is SO_2 calculation for PSD, requiring offset permit to be revised. Offset revision did not delay construction. (Delay due to PSD modeling and BACT analysis disputes.)
2	Exxon	None	15.0	0.0	Construction delayed due to company request to be re-evaluated with regard to applicability under the administrative stay. (EPA found them subject to PSD under the stay.)
6	Good Hope Refinery	LA-318	15.0	0.7	PSD application incomplete.

(continued)

Table C-1. Continued

EPA Region	Company Name	PSD Permit No.	Total Permitting Period (Months)[a]	Extra Time Attributable to Non-attainment Review (Months)[c]	Other Delaying Factors
7	Muscatine Power and Water	None	15.0	2.0	4.5 months between request for additional information and receipt of information. Two public comment periods delayed review period. Strong public participation.
3	PPG	79-WV-06	15.6	0.0	Bubble permit complications.
5	City of Columbus	EPA-5-A-80-3	16.0	0.0	Bids on city contract were higher than city budget, thereby delaying construction, and submittal of information delayed due to re-evaluation of project.
6	Conoco	LA-291	17.0	1.5	State issued offset permit, 5 months later EPA received PSD application. (Company disagreed that is was subject to PSD review regarding accumulation of emissions since 8/7/77.) State offset permit was amended after PSD permit was issued due to differences in NO_x emission limits required by state agency and EPA.
4	B. F. Goodrich[d]	KY-91	17.0	1.0	The last information submitted was 14 months after the PSD permit application was submitted. Company illegally underwent construction during permit review period.
6	Exxon Chemicals[d]	TX-302	18.4	0.3	Disagreement on NO_x (PSD) emissions limit for heaters. EPA accepted the change.
1	Refuse Fuels	23-121-MA-12	24.0[b]	5.0[b]	Applicant redesigned units and changed stack parameters which delayed review period approximately 5 months. Financial difficulties postponed construction.

(continued)

Table C-1. Concluded.

EPA Region	Company Name	PSD Permit No.	Total Permitting Period (Months)[a]	Extra Time Attributable to Non-attainment Review (Months)[c]	Other Delaying Factors
6	Gulf Oil Chemicals	TX-299	24.0	4.0	PSD and offset application were two separate time periods, original PSD application incomplete (monitoring requirements disputed by company).
3	Hampton Roads	78-VA-01	26.0	0.0	Large number of public comments on offsets. Offset permit application deficient.
3	Swan Chesapeake Terminal Corp.	78-VA-04	37.0[b]	5.0[b]	Pending EPA approval of SIP for offsets and response to a large number of public comments on offsets.

[a] Includes months from submittal date of 1st permit application (i.e. offset or PSD) to issue date of 2nd permit (offset or PSD).

[b] Offset permit not issued at time of analysis.

[c] Difference between total permitting time and time required for PSD permit issuance.

[d] Not included in TRW data base. EPA regional offices supplied permit information.

APPENDIX D. ANALYSIS OF PSD AND NONATTAINMENT REVIEW APPLICABILITY

D.1 INTRODUCTION

All data base applications were subject to either the 1978 or 1980 PSD regulations. These regulations have different applicability and regulatory requirements. The effect of the differing requirements is to complicate the analysis of Section 4.0. In any of the analyses presented in Section 4.0, assumptions concerning which applications and level of pollutant to be included in the analysis were made. The assumptions for each analysis are explained in this appendix under each applicable section.

In the analyses of Section 4.0, no distinction is made between pollutant emissions that have undergone PSD and nonattainment review. Under the 1980 New Source Review regulations, the applicability criteria for both PSD and nonattainment review are very similar. The main criteria for determining which review applies to a specific situation is the "attainment" status of the areas in which the proposed or existing source is located. Most State and local air pollution agencies are currently implementing nonattainment review programs. Data base emissions subject to nonattainment review constitute a very small part (about one percent) of total emissions in the data base. Therefore, the analyses presented in Section 4.0 do not consider PSD and nonattainment emissions individually. These emissions have been combined and presented collectively.

D.2 DISTRIBUTION OF CRITERIA POLLUTANT EMISSIONS

In order to analyze the effects of various cutoff levels for PSD applicability and pollutant review criteria, a "baseline" must first be established for each type of analysis. The primary focus of Section 4.2 is to establish an emissions "baseline" from which to assess the effects of various cutoff levels compared to the applicability criteria of the 1980 PSD and nonattainment regulations. The majority of data base applications (215 of 285) were reviewed under the applicable provisions of the 1978 regulations. For major modifications, the 1980 regulations apply only to increased "actual" emissions of a pollutant, considering the net effect of all increases and decreases occurring at a major source. The 1978 regulations concerning major modifications, in many cases, applied to pollutants at major sources, the emissions changes of which resulted in "net decreases". An in-depth air quality review was generally not required in these cases, but BACT requirements still applied to each new or modified (resulting in emissions increase) emissions unit associated with the project. Therefore, the 215 data base PSD applications subject to the 1978 regulations were screened to identify, on a pollutant-by-pollutant basis, those cases with net emissions decreases. These cases were then eliminated from consideration in the analysis of Section 4.2 because, under no circumstances, would they be subject to review under the 1980 regulations. Note that only the pollutant review was eliminated and not the entire PSD application, unless all pollutant emissions involved in the application are decreased.

Section 4.2 presents the emissions distribution of those data base applications with a net emissions increase in PM, SO_2, NO_x, CO and VOC. These emissions form the basis for each analysis presented in Section 4.0.

D.3 POLLUTANT REVIEWS AND EMISSIONS COVERAGE AT VARIOUS THRESHOLDS

Section 4.3 presents an analysis of the amount of pollutant reviews and associated emissions coverage lost at applicability thresholds ranging from "significant" to 2,500 tons per year. To construct any of Figures 4-6 through 4-10, the values of the pollutant specific net emissions increases were ranked in order of increasing size from smallest to the largest. Applications with a net decrease of an applicable pollutant were not considered. Also, those applications with a net increase of an applicable pollutant less than the "significant" level, as defined in the 1980 PSD regulations, were not considered. From this process, the plots shown in Figures 4-6 through 4-10 were constructed for PM, SO_2, NO_x, CO and VOC, respectively.

D.4 PERMIT APPLICATIONS ELIMINATED FROM REVIEW AT VARIOUS THRESHOLDS

The analyses of Section 4.4 were conducted on those 231 data base applications that were (or would be) subject to review under the 1980 PSD regulations. Those data base applications that were reviewed under the 1978 PSD regulations (215), but would not be subject to PSD review under the 1980 PSD regulations (54) were not included in the analyses of Section 4.4.

The 1980 PSD regulations apply to New Major Sources and Major Modifications. Each pollutant that is increased in "significant" amounts associated with a new major source and major modification is subject to review. One major assumption concerning the "major" status of data base sources reviewed under the 1978 regulations was made. As discussed in Appendix A, the 1980 regulations changed the basis for which "major" source status is determined. For modifications to be subject to review under these regulations, either of two criteria must be met:

1. The source must be "major" at the time of proposing significant emissions increases; or
2. The proposed emissions increase of any pollutant must, in and of itself, be a "major" quantity.

The 100/250 ton per year criterion still applies to determine "major" status. There are 40 major modifications in the data base applications which received PSD permits to increase pollutant emissions no greater than the applicable "major" quantity (100/250 tons per year). Therefore, it is difficult to determine if the source was "major" (1980 definition) at the time of proposing such increases. However, for the purpose of the analysis of Section 4.4, it was assumed that each of these sources was indeed major and would have been subject to the 1980 regulations. This probably is a valid assumption because any of these sources could have applied for and received a "recision" for parts or all of their PSD permit if they were not subject to the 1980 regulations. The PSD permit files for these 40 sources had not indicated either permit recision or even application for such at the time of data gathering.

D.5 ELIMINATION OF NON-CRITERIA POLLUTANTS FROM PSD REVIEW

Section 4.4 presents the distribution of applications with net emissions increases of non-criteria pollutants at selected thresholds. The table (4-2) was constructed using all data base applications with a net emissions increase of a non-criteria pollutant. Those applications with a net decrease in a criteria pollutant were not included in the table.

APPENDIX E. ANALYSIS OF BACT AND LAER

E.1 INTRODUCTION

The analyses of Section 5.0 focus on the emissions resulting from case-by-case BACT or LAER technology reviews. However, the data base contains a few instances where emission units are specified in PSD permits that were not subject to BACT or LAER criteria. For example, in order to avoid an increment violation, applicants chose to reduce emissions at an existing emission unit after BACT had been applied to new or modified emission units. Similarly, a source subject to nonattainment provisions was required to at least "offset" proposed emission increases, usually at other emission units. To be enforceable, these "offset" emission units were, in some cases, specified in the PSD permit. Additionally, to avoid being subject to review requirements for a pollutant, enforceable permit conditions were specified limiting the emissions below the cutoff point. In other cases, upon discovering potential increment or NAAQS violations after applying case-by-case BACT to new and modified emission units, some PSD applicants determined it was necessary to reduce proposed emissions to the point where dispersion modeling indicated no such violations.

The analyses presented in Section 5.0 focus only on emission units subject to either BACT (BACT-permitted) or LAER (LAER-permitted) provisions. Furthermore, many PSD applications indicated emission reductions accompanying emission increases, such as cases involving replacements. These associated emission reductions are neither considered nor quantified in Section 5.0.

E.2 TECHNOLOGY REVIEWS

Section 5.2 presents the number of data base applications and emission units that were subject to BACT or LAER review. The data presented is compiled from all (285) data base applications. No attempt was made to exclude those emission units subject to BACT review under the 1978 PSD regulations that would be eliminated from BACT review under the 1980 PSD regulations.

As seen in Section 5.2, the pollutant most frequently subject to BACT review is nitrogen oxides (NO_x) followed by particulate matter (PM) and sulfur dioxide (SO_2). VOC is the pollutant most frequently subject to LAER followed by PM, CO, SO_2, and NO_x. For the most part, NO_x is a combustion product which, unlike SO_2 and PM, triggered PSD review for sources installing internal combustion engines and turbines. Examples of sources which fall in this category are natural gas pumping stations (compressors) and utilities using peaking load turbines. Many other sources were reviewed for standby diesel power generators in addition to their primary project. Sulfur dioxide, predominantly a combustion product, is also emitted from process emission units. Much of the permitted PM emissions result from process emission units such as those involved in materials handling. CO is almost exclusively a combustion product and competes with nitrogen oxide emissions in the control process. Most combustion processes are related such that an increase in NO_x emissions is accompanied by a decrease in CO emissions and vice versa. VOC emissions generally result from incomplete combustion and evaporation from process equipment. Evaporation from process equipment such as dryers and kilns is generally quantifiable, whereas VOC emissions from storage tanks, valves and flanges, pumps and compressors, etc., are difficult to quantify. For this reason, BACT or LAER for VOC is generally defined in terms of work practice or equipment standards.

E.3 EFFECTS OF NSPS AND NESHAPS ON BACT AND LAER

Section 5.3 presents the effects of NSPS (and NESHAPS) on BACT and LAER reviews and associated emissions. The analyses were conducted on all (285) data base applications required to undergo BACT or LAER review. In all cases, the reviewing authorities' determinations of NSPS applicability was used as a basis for each analysis. These determinations concerned the following points:

1. Whether or not an emission unit was subject to NSPS;
2. The pollutant specific emission limit required by the NSPS.

Any questions concerning the above determinations were answered by contacting the applicable review authority.

The majority of SO_2 and fluoride emission reductions beyond NSPS were achieved by scrubbers with higher removal efficiency than that required by the NSPS. About 40 percent of the utility source SO_2 emission reductions beyond NSPS were achieved at two large utility power plants - Intermountain Power Company and Nevada Power Company.

E.4 BACT VS. LAER

Section 5.4 presents data taken from the 35 data base applications known to be subject to both PSD and nonattainment review. In the 1978 PSD regulations, situations arose where, due to applicability criteria definitions, a source was subject concurrently to both PSD and nonattainment review for the same pollutant. Although this was not true for the 1980 PSD regulations, a source applying for a PSD permit under the 1980 regulations in some cases underwent PSD review for one pollutant and nonattainment review for another pollutant. Furthermore, some sources received separate PSD and nonattainment permits, the latter primarily issued by the respective state agency. In these cases, LAER and other nonattainment permit data were not included in the EPA PSD permit file and thus, are not included in the data concerning nonattainment criteria discussed in this report.

E.5 EFFECT OF EMISSION UNIT SIZE ON BACT-PERMITTED EMISSIONS AND EMISSION REDUCTIONS BEYOND A NSPS

Section 5.5 presents the distributions of BACT-permitted emissions, BACT-permitted emissions subject to a NSPS, and emission reductions beyond a NSPS. The data presented are the data base emissions and emission units permitted according to BACT or LAER provisions. In many instances, pollutant emissions were specified in PSD permits but were not subject to either BACT or LAER. This occurred when emissions of certain pollutants were subject to PSD but were not large enough to trigger BACT/LAER review under the regulations existing at the time (i.e., Tier 1 reviews). These cases were not subject to the applicable technology review requirements, and their emissions are not included in the analyses presented in Section 5.5.

E.6 PROPOSED VS. PERMITTED BACT

Data presented in Section 5.6 were extracted from all (285) data base applications and permits to determine where permitted BACT allowable emission rates are different than those originally proposed by the PSD applicant. To assess the level of emissions originally proposed by the applicant, applicable EPA regional offices were contacted concerning each data base application. EPA regional office personnel extracted all relevant data from EPA files and other sources of documentation. Data from the EPA files indicated that 63 data base permit applications had proposed BACT limits less stringent than the final permit emission limitations. Furthermore, the EPA records of telephone contact indicated numerous requests by PSD applicants for typical BACT emission "ranges" prior to submitting their applications.

APPENDIX F. ANALYSIS OF AIR QUALITY IMPACTS

F.1 INTRODUCTION

To analyze the frequency and the effects of required PSD air quality (A/Q) impacts analyses, the following information was collected for each data base application:

1. Subject PSD regulations;
2. Pollutants subject to A/Q review requirements;
3. Pollutants modeled;
4. Source of existing ambient air quality data;
5. Predicted increment and NAAQS concentrations (including the applicant's contribution);
6. Distance to nearest Class I area.

This data was collected based on the data selection criteria provided in Appendix B.

F.2 FREQUENCY OF AIR QUALITY ANALYSES

Both the 1978 and 1980 PSD regulations specify criteria for exempting certain pollutants from required air quality analyses. These criteria are generally based on levels of net emissions increases and resulting ambient impacts. Therefore, a source subject to PSD for two or more pollutants may be required to perform analyses at varying levels of detail for each pollutant and may possibly be exempt from air quality analyses altogether for some or all pollutants.

Source Applicability

In support of the analysis of Section 6.2, the distribution of data base PSD applications subject to A/Q review under the 1978 and 1980 PSD regulations is provided in Table F-1 by the number of pollutants requiring A/Q review.

Of the 285 data base applications, 72 were not required to perform full air quality analyses for the following reasons:

Table F-1. DISTRIBUTION OF DATA BASE PSD APPLICATIONS SUBJECT TO AIR QUALITY REVIEW BY NUMBER OF POLLUTANTS PER APPLICATION

	Number of Pollutants per Application Subject to Air Quality Review				
	1	2	3	4	Total
Number of PSD Applications Subject to Air Quality Review					
- under 1978 PSD Regulations	65	33	32	14	144
- under 1980 PSD Regulations	19	16	19	15	69
Total	84	49	51	29	213
Percent of PSD Applications Subject to Air Quality Review					
- under 1978 PSD Regulations	45%	23%	22%	10%	100%
- under 1980 PSD Regulations	28%	23%	28%	21%	100%
Average	40%	23%	24%	13%	100%

- A "Tier 1" review was required for 49 of these applications. This review applied to those cases where gross increases (ignoring reductions) in allowable emissions were less than 50 tons per year for each pollutant subject to PSD. Contingent upon a demonstration of no adverse air quality impact and no impact upon Class I areas or known increment violations, "Tier 1" review exempted these sources from full air quality review.
- Twelve (12) of the remaining 22 data base applications for which no air quality reviews were required were reviewed for Best Available Control Technology (BACT) only. This review applied to those cases where gross increases (ignoring reductions) in allowable emissions exceeded 50 tons per year and emissions reductions at the source equalled or exceeded the allowable emissions increases associated with the proposed project.
- Six (6) of the remaining 10 applications were subject to PSD review only for VOC emissions. Because of inadequate dispersion modeling techniques for this pollutant (ozone precurser), full air quality analyses were not required. The reasons are unknown for why the remaining four applications did not perform full air quality analyses.

F.3 ANALYSIS OF ALLOWABLE PSD INCREMENTS

The data base air quality increment impacts presented in Section 6.3 are based solely on Class II increment analyses. None of the data base sources are located in any Class III area and four (4) performed full increment impact analyses for Class I areas. Furthermore, sources that are located near Class I areas were generally required to perform Class II increment analysis in addition to the Class I area analysis. Therefore, each application subject to full air quality analyses for PM, or SO_2, or both performed a Class II area increment analysis. The allowable increments for Class II areas are:

Pollutant/ Averaging Time	Allowable Class II Increment (ug/m^3)
PM	
-24 hour	37[a]
-Annual	19
SO_2	
-3 hour	512[a]
-24 hour	91[a]
-Annual	20

[a] Not to be exceeded more than once per year.

Increment Consumption

Analyses for the purpose of demonstrating compliance with allowable PSD increments (PM and SO_2 only) required, in almost all cases, dispersion modeling of all PM or SO_2 (or both) emissions which affect increment concentrations. In remote locations or areas where few "increment" emissions exist, this task is relatively simple. However, in heavily industrialized areas, the PSD applicant has to consider the "increment" emissions of numerous (over 100 in some cases) sources before compliance demonstrations could be made.

Generally, an increment concentration is defined as that portion of the ambient air concentration in an area which results from:

1. Emissions increases and decreases at major stationary sources resulting from construction that commenced after January 6, 1975; and
2. Emission increases and decreases at all stationary sources occurring after the "baseline date".

Under the 1978 PSD regulations, a uniform "baseline date", August 7, 1977, was specified. "Baseline date" for a PSD area was redefined by the 1980 PSD regulations as being the earliest date after August 7, 1977, on which the first complete PSD application that is subject to the 1980 amended PSD regulations was submitted. In addition, under the 1980 regulations, baseline date determinations are pollutant and area specific.

Increment Consumption Impacts by Source Type and EPA Region

The analysis of Section 6.2 was conducted for those data base applications where the A/Q analyses showed greater than 70% of the available increment to be consumed. The 70% cutoff point was arbitrarily chosen as an indicator of high increment consumption.

Increment consumption impacts are generally determined by air quality dispersion modeling of increment consuming sources within a specific area surrounding the proposed project.

Effects of Allowable PSD Increment Constraints

During data collection, TRW engineers noted cases where the increments were major factors in altering the project proposed by the PSD applicant. These changes, in some way, resulted in decreased increment consumption of the proposed projects. Section 6.4 presents an analysis of 28 project alterations which occurred as the result of increment impacts analyses.

F.4 ANALYSIS OF NATIONAL AMBIENT AIR QUALITY STANDARDS IMPACTS

National Ambient Air Quality Standards (NAAQS) apply only to criteria pollutants and are presented in Table F-2. These standards are defined in terms of total ambient pollutant concentrations that are not to be exceeded more than once per year for other than an annual time period.

NAAQS Impact Analyses

Generally NAAQS compliance demonstrations involve superimposing the projected ambients impacts of the proposed project on the values representative of existing air quality. In some cases, the PSD applicant must also consider those emissions expected from projects that have been approved but are not in operation at the time of PSD application submittal. The impacts of anticipated emissions (the PSD applicants' and other sources') are generally determined by dispersion modeling using EPA-approved techniques. In most cases, the NAAQS compliance demonstration involved adding highest existing ambient concentrations to "worst case" projected impacts. Consequently, the resulting values representing projected future air quality are generally conservative and possibly overpredict actual future air quality.

Effects of Constraints Caused by National Ambient Air Quality Standards (NAAQS)

To assess the effects of constraints caused by NAAQS, the results of the analysis provided in Section 6.4.1 were analyzed. Section 6.4.2 provides a summary of those cases where the A/Q analyses predicted greater than 90% of the respective NAAQS. The 90% cutoff point was arbitrarily chosen as an indicator of high ambient air quality concentrations.

Table F-2. NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Ambient ceilings,[a] ug/m^3
Particulate matter	Annual Geometric mean	75
	24-hr[b]	150
Sulfur dioxide	Annual Arithmetic mean	80
	24-hr[b]	365
	3-hr[b]	1,300
Nitrogen dioxide	Annual Arithmetic mean	100
Carbon monoxide	8-hr[b]	10[c]
	1-hr[b]	40[c]
Ozone	1-hr[b]	235
Lead	Calendar Quarter	1.5

[a] The lower concentration of either the primary or secondary NAAQS.

[b] Not to be exceeded more than once per year.

[c] Milligram/meter^3.

F.5 ANALYSIS OF SITE SPECIFIC AMBIENT MONITORING DATA

The analysis presented in Section 6.5 provides a comparison of those data base applications where site specific ambient monitoring data was provided and the A/Q analyses projected greater than 75% of the applicable NAAQS. The cutoff point of "75% NAAQS" was arbitrarily chosen as an indicator of expected ambient concentrations that approach the NAAQS ceilings.

F.6 CLASS I AREA ANALYSES

As indicated in the 1978 and 1980 PSD regulations, all PSD areas have been classified as either Class I, Class II or Class III areas, and different allowable increments of PM and SO_2 concentrations have been established for each type of area. As shown below, the most restrictive allowable increments exist for Class I areas.

Pollutant/ Averaging Time	Allowable PSD Increments (ug/m^3)		
	Class I	Class II	Class III
PM			
-24 hour	10[a]	37[a]	75[a]
-Annual	5	19	37
SO_2			
-3 hour	25[a]	512[a]	700[a]
-24 hour	5[a]	91[a]	182[a]
-Annual	2	20	40

[a] Not to be exceeded more than once per year.

Class I areas include, but are not limited to the following areas which were in existance on August 7, 1977.

1. International parks;
2. National wilderness areas which exceed 5000 acres in size;
3. National Memorial parks which exceed 5000 acres in size; and
4. National parks which exceed 6000 acres in size.

Class I area impacts analyses are generally required when a proposed project will be located within 100 kilometers of a Class I area.

An analysis of permit processing delays due to concerns over Class I area impacts was provided in Section 6.5. For this analysis, a permitting delay was chosen as more than nine months from application submittal to final permit issuance.

F.7 EFFECT OF A/Q CONSTRAINTS ON EMISSIONS REDUCTIONS BEYOND NSPS

For those PSD permits where PM and/or SO_2 allowable emissions were below the maximums allowed by the applicable NSPS, the A/Q analyses were evaluated to determine the quantity of emissions reductions attributable to:

1. NAAQS compliance constraints;
2. Increment compliance constraints; and
3. Case-by-case BACT.

These quantities were determined for each source by scaling the permitted emissions rates up to the highest rate allowed by the NSPS and then estimating the resulting maximum air quality and increment consumption in the sources' impact areas. In those cases where the NSPS emission rate would not have resulted in either NAAQS or increment violation, the total emissions reduction beyond NSPS was assumed to be attributable to case-by-case BACT. Where the NSPS emission rate was predicted to cause either a NAAQS or an increment violation, the emission rate that could have been allowed at the threshold of violation was determined. (Note: For this purpose the increment violation threshold was arbitrarily chosen as 95% of the allowable increment. That is, any emission reductions beyond that needed to show 95% increment consumption were attributed to case-by-case BACT.). This threshold rate was then subtracted from the NSPS rate and the resulting emissions reduction was attributed to its respective cause.

In many cases, the permit files indicated the sources' PM air quality impacts were "insignificant". Because of this, the application did not contain either maximum ambient concentration or increment consumption calculations. As a result, it was not possible to categorize all PM emissions reductions beyond NSPS. Similarly, some SO_2 emissions reductions beyond NSPS were unclassifiable.

For sources not subject to a NSPS, it is impossible to precisely evaluate the effects of A/Q constraints on permitted emissions. This results from the inability to determine the extent to which NAAQS and/or increments affected the applicants' BACT decision-making. For instance, where an applicant changed the proposed BACT emission level prior to application submittal as a result of increment constraints, the degree to which the constraint affected proposed emissions rates cannot be evaluated.

APPENDIX G

Example Source Data and Coding Forms

Form Name	Page	Purpose or Use
PSD Permit Data Form	D2-4	Field Data Gathering
Record Field Allocations	D5-10	Data Coding for Computer Format
Final Codes	D11-15	Definition of Data Codes

PSD PERMIT DATA SHEET

EPA REGION: ______

PSD Permit Issued To: ______

Review Performed By: ______

Source Location: ______

Source Type: ______

Permit No.: ______

Date Permit Issued: ______

Date Application Submitted: ______

Date Last Information Submitted: ______

One of 28? Yes ___ No ___

Project Description: New ___ Modified ___ Source; Describe: ______

Project Subject To: 1978 ___ 1980 ___ PSD Regulations.

Application Prepared By: ______

Person or Contact: ______

Telephone No. (or Address): ______

GENERAL DATA

Permitted Emissions Gross Increases (Tons/yr): PM ___ SO_2 ___ NO_x ___ CO ___ VOC ___ Other ___ Other ___

Permitted Emissions Gross Decreases (Tons/yr): PM ___ SO_2 ___ NO_x ___ CO ___ VOC ___ Other ___ Other ___

Permitted Emissions Net Increases (Tons/yr): PM ___ SO_2 ___ NO_x ___ CO ___ VOC ___ Other ___ Other ___

Number of Emissions Units Permitted with Emission Increase: ______ Point Source: ______ Fugitive: ______

Pollutants Subject to PSD or Non/Att Review: PM ___ SO_2 ___ NO_x ___ CO ___ VOC ___ Other ___ Other ___

Were Pollutants Modeled: PM ___ SO_2 ___ NO_x ___ CO ___ VOC ___ Other ___ Other ___

If Not Modeled, why not?: ______

Was Ambient Monitoring Provided? Yes ___ NO ___ For Which Pollutants and Which Years: ______

Source of Monitoring Data: Source Sponsored ___ State Network ___ or Other (specify): ______ Years of Met Data Modeled: ___

Cause of Permitting Bottleneck: ______

Was PSD Application Subject to NSPS or NESHAPS: Yes ___ No ___ If yes, specify each: ______

Nearest Class I Area: ______ Distance: ______

Comments: ______

Air Quality Data

Pollutant	Averaging Time	Maximum Downwind Impact	Maximum Increment Consumed In Impact Area		Applicant's Contribution To Maximum Increment ug/m3	Maximum Ambient Pollutant Concentration Predicted ug/m3	Applicant's Contribution At Point of Maximum Ambient Impact ug/m3
			ug/m3	%Allowable			
TSP	24-Hour						
	Annual						
SO_2	3-Hour						
	24-Hour						
	Annual						
NO_x	Annual						
CO	1-Hour						
	8-Hour						
VOC	(Specify)						
Other (Specify)	(Specify)						
Other (Specify)	(Specify)						

Fugitive PM Modelled ____________ Particle Size Distribution Allowance ____________

Note 1: If information indicates that an increment or NAAQS violation threatened this project, investigate and determine corrective action taken. Specify which increment or NAAQS was controlling and corrective action taken. Controlling Increment ____ NAAQS ____. Original Violation Level ____ reduced to ____. Reduced By: Stack Height change from ____ to ____. Emissions reduced from ____ to ____. Other (Explain): ____________.

Note 2: Specify whether highest or second highest used.

Comments: ____________

Control Technology Data - All Emission Units in PSD Permit

Emissions Unit	Size or Capacity	Type (Combustion, Process, etc.)	New or Modified	Fuel Used				Allowable Emissions Increase (+) or Decrease (-)		Control Strategy		Is Unit Subject to NSPS? Identify Which	Size Exemption of NSPS	Allowable Emissions of NSPS*	Equivalent BACT Allowable Emissions*
				Type	%S	%Ash		lbs/hr	Tons/yr	Chosen	Alternatives				
							PM								
							SO_2								
							NO_x								
							CO								
							VOC								
							Other								
							PM								
							SO_2								
							NO_x								
							CO								
							VOC								
							Other								
							PM								
							SO_2								
							NO_x								
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							PM								
							SO_2								
							NO_x								
							CO								
							VOC								
							Other								
							PM								
							SO_2								
							NO_x								
							CO								
							VOC								
							Other								

*Specify comparable units of allowable emissions.

Note: Group all sources of VOC only emissions together.

RECORD FIELD ALLOCATIONS

Permit Number	Description		Answer
A. GENERAL DATA			
1	EPA Region		______
2	Permit issued to		______
3	Permit #		______
4	Review performed by (coded)		______
5	Permit timing (coded)		______
6	Source location -	city	______
		county	______
		state	______
7	Source type (coded)		______
8	Project description (coded)		______
9	Subject regulations (coded)		______
10	Other pollutants subject (coded)		
		Pollutant 1	______
		Pollutant 2	______
11	Emissions increases (t/yr)		
		PM	______
		SO_2	______
		NO_x	______
		CO	______
		VOC	______
		Other 1	______
		Other 2	______
12	Emission decreases (t/yr)		
		PM	______
		SO_2	______
		NO_x	______
		CO	______
		VOC	______
		Other 1	______
		Other 2	______
13	Net increases (may be negative, t/yr)		
		PM	______
		SO_2	______
		NO_x	______
		CO	______
		VOC	______
		Other 1	______
		Other 2	______

14 Number of point sources permitted ______

15 Number of fugitive sources permitted ______

16 Pollutants subject to PSD or Non/Att Review (coded)
- PM ______
- SO_2 ______
- NO_x ______
- CO ______
- VOC ______
- Other 1 ______
- Other 2 ______

17 Were pollutants modelled (coded)
- PM ______
- SO_2 ______
- NO_x ______
- CO ______
- VOC ______
- Other 1 ______
- Other 2 ______

18 If not modelled, why not? (coded)
- PM ______
- SO_2 ______
- NO_x ______
- CO ______
- VOC ______
- Other 1 ______
- Other 2 ______

19 Ambient monitoring provided (coded) ______

20 Source of monitoring data (coded) ______

21 Years of metorological data modelled (coded) ______

22 Cause of permitting bottleneck (coded) ______

23 Application subject to NSPS or NESHAPS (coded) ______

24 Distance to nearest Class I area (coded) ______

B. AIR QUALITY DATA

PM - 24hr

25 Max. downwind impact ______

26 Max. increment consumed in impact area ______

27 % allowable ______

28 Applicants contribution to max. impact ______

29 Max. ambient pollutant concentration predicted ______

30 Applicants contribution at point of max. ______

PM - annual

31 Max. downwind impact ______

32 Max. increment consumed in impact area ______

33 % allowable ______

34 Applicants contribution to max. impact ______

35 Max. ambient pollutant concentration predicted ______

36 Applicants contribution at point of max. ______

SO_2 - 3hr

37 Max. downwind impact ______

38 Max. increment consumed in impact area ______

39 % allowable ______

40 Applicants contribution to max. impact ______

41 Max. ambient pollutant concentration predicted ______

42 Applicants contribution at point of max. ______

SO_2 - 24hr

43 Max. downwind impact ______

44 Max. increment consumed in impact area ______

45 % allowable ______

46 Applicants contribution to max. impact ______

47 Max. ambient pollutant concentration predicted ______

48 Applicants contribution at point of max. ______

SO_2 - annual

49 Max. downwind impact ______

50 Max. increment consumed in impact area ______

51 % allowable ______

52 Applicants contribution to max. impact ______

53 Max. ambient pollutant concentration predicted ______

54 Applicants contribution at point of max. ______

NO_x - annual

55 Max. downwind impact ______

56 Max. ambient pollutant concentration predicted ______

57 Applicants contribution at point of max. ______

CO - 1hr

58 Max. downwind impact ______

59 Max. ambient pollutant concentration predicted ______

60 Applicants contribution at point of max. ______

CO - 8hr

61 Max. downwind impact ______

62 Max. ambient pollutant concentration predicted ______

63 Applicants contribution at point of max. ______

VOC

64 Averaging period (coded) ______

65 Max. downwind impact ______

66 Max. ambient pollutant concentration predicted ______

67 Applicants contribution at point of max. ______

Other 1

68 Averaging period (coded) ______

69 Max. downwind impact ______

70 Max. ambient pollutant concentration predicted ______

71 Applicants contribution at point of max. ______

Other 2

72 Averaging period (coded) ______

73 Max. downwind impact ______

74 Max. ambient pollutant concentration predicted ______

75 Applicants contribution at point of max. ______

76 Fugitive PM modelled (coded) ______

77 Particle size distribution allowance (coded) ______

78 Corrective action (coded) ______

79 Highest or second highest (coded) ______

C. CONTROL TECHNOLOGY DATA

80 Number of emission units (number of repetitive blocks to this section) ______

EMISSION UNIT NO. 1

Size or Capacity

81 Size or capacity value (in NSPS units if applicable) ______

82 Size exemption of applicable NSPS (in NSPS units) ______

83 Unit of size or capacity (in applicable NSPS units) (coded) ______

84 Type of facility (coded) ______

85 New or modified facility (coded) ______

Fuel Used

86 Type (coded) ______

87 % S ______

88 % Ash ______

Emissions Increases or Decreases

89 PM lb/hr ______

90 T/yr ______

91 BACT determination ____________

92 No. of control alterantives considered ______

93 Subject to NSPS (coded) ______

94 Allowable NSPS emissions (in NSPS units) ______

95 Equivalent BACT allowable emissions (in NSPS units) ______

96 Unit of NSPS or BACT emissions (coded) ______

97 SO_2 lb/hr ______

98 T/yr ______

99 BACT determination ____________

100 No. of control alterantives considered ______

101 Subject to NSPS (coded) ______

102 Allowable NSPS emission (in NSPS units) ______

103 Equivalent BACT allowable emissions (in NSPS units) ______

104 Unit of NSPS or BACT emissions (coded) ______

105 NO_x lb/hr ______

106 T/yr ______

107 BACT determination ____________

108 No. of control alternatives considered ______

109 Subject to NSPS (coded) ______

110 Allowable NSPS emissions (in NSPS units) ______

111 Equivalent BACT allowable emissions (in NSPS units) ______

112 Unit of NSPS or BACT emissions (coded) ______

113 CO lb/hr ______

114 T/yr ______

115 BACT determination ____________

116 No. of control alternatives considered ______

117 Subject to NSPS (coded) ______

118 Allowable NSPS emissions (in NSPS units) ______

119 Equivalent BACT allowable emissions (in NSPS units) ______

120 Unit of NSPS or BACT emissions (coded) ______

121 VOC lb/hr ______

122 T/yr ______

123 BACT determination ____________

124 No. of control alternatives considered ______

125 Subject to NSPS (coded) ______

126 Allowable NSPS emissions (in NSPS units) ______

127 Equivalent BACT allowable emissions (in NSPS units) ______

128 Unit of NSPS or BACT emissions (coded) ______

129 Other 1 lb/hr ______

130 T/yr ______

131 BACT determination ____________

132 No. of control alterantives considered ______

133 Subject to NSPS (coded) ______

134 Allowable NSPS emissions (in NSPS units) ______

135 Equivalent BACT allowable emissions (in NSPS units) ______

136 Unit of NSPS or BACT emissions (coded) ______

137 Other 2 lb/hr ______

138 T/yr ______

139 BACT determination ____________

140 No. of control alternatives considered ______

141 Subject to NSPS (coded) ______

142 Allowable NSPS emissions (in NSPS units) ______

143 Equivalent BACT allowable emissions (in NSPS units) ______

144 Unit of NSPS or BACT emissions (coded) ______

145 Opacity % ______

Repeat for each Unit

FINAL CODES

Question Number

4 Review Performed by:

1 = EPA
2 = State
3 = Contractor
0 = Unknown

5 Permit Timing:

1 = Date application submitted to last information submitted less than 6 months and to final permit issued less than 9 months.
2 = Date application submitted to last information submitted less than 6 months and to final permit issued greater than 9 months.
3 = Date application submitted to last information submitted greater than 6 months and to final permit greater than 9 months.
4 = Date application submitted to last information submitted greater than 6 months and to final permit less than 9 months.
5 = Permit not yet issued.
0 = Unknown

7 Source Type:

1 = Electric plants greater than 250 MMBTU/hr heat input
2 = Coal cleaning plants (with thermal dryers)
3 = Kraft pulp mills
4 = Portland cement plants
5 = Primary zinc smelters
6 = Iron and steel mills
7 = Primary aluminum ore reduction plants
8 = Primary copper smelters
9 = Municipal incinerators capable of charging more than 250 tons of refuse per day
10 = Hydrofluoric acid plants
11 = Sulfuric acid plants
12 = Nitric acid plants
13 = Petroleum refineries
14 = Lime plants
15 = Phosphate rock processing plants
16 = Coke oven batteries
17 = Sulfur recovery plants
18 = Carbon black plants (furnace process)
19 = Primary lead smelters
20 = Fuel conversion plants
21 = Sintering plants
22 = Secondary metal production plants
23 = Chemical process plants
24 = Fossil fuel boilers (or combination thereof) greater than 250 MMBTU/hr heat input

FINAL CODES
(Continued)

Question Number

7
(Continued)

25 = Petroleum storage and transfer units with a total storage capacity greater than 3000,000 barrels
26 = Taconite ore processing plants
27 = Glass fiber processing plants
28 = Charcoal production plants
29 = Coal mining
30 = Iron ore mining
31 = Stone quarry
32 = Other mining
33 = Natural gas and crude oil pumping stations
34 = Municipal incinerators capable of charging less than 250 tons of refuse per day
35 = Fossil fuel-fired boilers less than 250 MMBTU/hr heat input
36 = Electric plants less than 250 MMBTU/hr heat input
37 = Petroleum storage and transfer units with a total storage capacity less than 3000,000 barrels
38 = Asphalt production plants
39 = Miscellaneous petroleum product production (greases, waste oil processing, etc.)
40 = Rubber and plastic production plants
41 = Textile manufacturing
42 = Lumber and wood products manufacturing
43 = Agricultural chemical production (fertilizers, pesticides, etc.)
44 = Natural gas processing plant
45 = Solid waste reclimation
46 = Graphite electrode plant
47 = Automotive part manufacturing
48 = Kaolin processing
49 = Food processing
50 = Printing plant
51 = Salt manufacturing
52 = Brewery
53 = Computer manufacturing
54 = Glass manufacturing
55 = Geothermal power steam electric plant

8

Project Description

1 = New
2 = Modified, additional combustion units added
3 = Modified, additional processing units added
4 = Modified, fuel switch
5 = 2, 3 above
6 = 2, 3, 4 above

FINAL CODES
(Continued)

Question Number

9 Subject Regulations:

1 = 1978 Regulations
2 = 1980 Regulations

10 Other Pollutants Covered:

0 = Not subject
1 = Lead
2 = Asbestos
3 = Beryllium
4 = Mercury
5 = Vinyl chloride
6 = Fluorides
7 = Sulfuric acid mist
8 = Total reduced sulfur (including H_2S)
9 = Reduced sulfur (including H_2S)
10 = Hydrogen sulfide
11 = Other

16
1 = PSD
2 = Non/Att Review
0 = Not Subject

17
1 = Yes
2 = No

18
1 = Insignificant increase in emissions to cause downwind impact (modeling was required)
2 = Non-attainment area construction
3 = Less than 50 tons per year increase under 1978 regulations
4 = Oversight
5 = Unknown
0 = Not subject or was modeled

19
1 = Yes
2 = No
0 = Unknown

20
1 = Source sponsored
2 = State network
3 = Other
0 = None was provided or unknown

21
1 = 1 year
2 = Greater than 1 year less than 5 years
3 = Greater than or equal to 5 years
0 = No modeling occurred or unknown

FINAL CODES
(Continued)

Question Number	
22	1 = Monitoring data required 2 = Applicability determination concerns 3 = BACT analysis concerns 4 = Increment analysis concerns 5 = NAAQS analysis concerns 6 = Class I area impact concerns 7 = Additional impact analysis concerns 8 = Application found complete in less than 6 months, EPA lag time in processing application caused bottleneck 9 = Other 10 = Unknown 0 = No bottleneck occurred
23	1 = Yes 2 = No
24	1 = Less than 50 kilometers 2 = Greater than or equal to 50 kilometers less than 100 kilometers 3 = Greater than or equal to 100 kilometers 0 = Unknown
64, 68, 72	1 = 1-hour average 2 = 3-hour average 3 = 8-hour average 4 = 24-hour average 5 = Annual average
76	1 = Yes 2 = No 0 = Unknown
77	1 = Yes 2 = No 0 = Unknown
78	1 = Emission reduction at proposed units (BACT change) 2 = Stack height change 3 = Process change (fuel switch) 4 = Orientation of emissions unit changed 5 = Emissions reductions elsewhere at plant 6 = Hours of operation limitation 7 = Other 0 = No corrective action (less than 85% increment consumed) or unknown
79	1 = Highest 2 = Second highest 0 = No modeling occurred or unknown

FINAL CODES
(Continued)

Question Number	
83	1 = MMBTU/hr heat input 2 = Tons/hr coal burned 3 = SCFM input 4 = Tons per day production capacity 5 = Tons per year production capacity 6 = SCFM produced 7 = Gal/yr produced 8 = Other 9 = bbl/stream day 10 = Horse power 0 = Not applicable (process unit, etc.)
84	1 = Combustion 2 = Process 3 = Both
85	1 = New 2 = Modified
86	1 = Gas 2 = Liquid 3 = Solid 4 = Combination
93, 101, 117, 125	1 = Yes 2 = No
96, 104, 112, 120, 128, 136, 144	1 = lb/MMBtu 2 = gr/dscf 3 = ppm (vol. %) 4 = lb/ton produced 5 = lb/1000 lb coke burnoff 0 = Not applicable